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V E G E T A T I O N A N D B I O D I V E R S I T Y M A N A G E M E N T P L A N

Response to Comments on the Draft Tiered Program Environmental Impact Report

Marin County Open Space District

State Clearinghouse No.2013112063

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9.0 COMMENTS AND RESPONSES

9.1 INTRODUCTION TO THE COMMENTS AND RESPONSES

This chapter contains the public and agency comments received during the public review period on the *Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report* (Draft TPEIR).

The Marin County Open Space District prepared and on May 6, 2015, circulated the Draft TPEIR on the proposed *Vegetation and Biodiversity Management Plan*. During the 60-day public review period from May 6, 2015, to July 8, 2015, comments on the Draft TPEIR were solicited from governmental agencies and the public. The Marin County Parks and Open Space Commission conducted a public hearing on May 21, 2015 regarding the adequacy of the Draft TPEIR.

All oral comments made at the public hearing on the Draft TPEIR held by the Marin County Open Space Commission on May 21, 2015 and all written comments received during the 60-day public review period are addressed in this chapter.

Proposed revisions to the ***Vegetation and Biodiversity Management Plan*** are shown in **Section 9.1**.

The governmental agencies, organizations, and individuals who commented on the Draft TPEIR are listed in **Section 9.3 Persons Commenting**.

Section 9.4 provides master responses that have been prepared for selected comment topics to provide a comprehensive analysis of major environmental issues raised in multiple comments. These master responses are often referred to in the response to individual comments in section 9.5.

Section 9.5 Responses to Comments presents and responds to all comments on the Draft TPEIR and the project's environmental effects. The original letters are reproduced, and comments are numbered for referencing with responses. Responses to individual comments raising significant environmental points are presented immediately after each comment letter. **Section 9.5** also includes comments made orally at the public hearing with responses presented immediately following the minutes of the meeting.

The Draft Mitigation Monitoring Program for the *Vegetation and Biodiversity Management Plan* is included in the Appendix.

Comments received on the Draft TPEIR can generally be classified into one of three categories. These categories are as follows:

1. ***Project Merits / Process Comments*** -- These comments do not pertain to physical environmental issues but pertain to the merits of the project or to comments on the County's review process. These comments are included in this document although responses to these comments are not necessary. Inclusion of these comments will make

the commentor's views available to public officials who will make decisions about the project itself.

2. ***Commentor Opinion*** -- These are comments from commentors which either support or disagree with the conclusions of specific information included in the Draft TPEIR. Although a commentor may hold a different opinion than the information provided in the Draft TPEIR, these comments do not, however, focus on the adequacy of the Draft TPEIR. Section 15151 of the *State CEQA Guidelines* states that an EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Furthermore, disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts.

   In light of section 15151 commentor's opinions are included in this document although responses to these comments are not necessary. Inclusion of these comments will make the commentor's views available to public officials who will make decisions about the project itself. Where appropriate, some additional explanatory information to help clarify information provided in the Draft TPEIR is provided.

3. ***Questions Regarding Adequacy of Draft TPEIR --*** These are comments from commentors who question the adequacy of specific information in the Draft TPEIR. Responses to individual comments requiring clarification of environmental issues regarding the Draft TPEIR are provided in this document.

In some instances, text changes resulting from the comments and responses are recommended. In these instances information that is to be deleted is ~~crossed out~~, and information that is added is underlined. The text changes resulting from comments and responses have been incorporated in the original Draft TPEIR text, as indicated in the responses.

RECIRCULATION OF DRAFT TPEIR

Section 15088.5 of the *State CEQA Guidelines* states that a lead agency is required to recirculate an EIR when significant new information is added to the EIR after public notice is given of the availability of the Draft EIR for public review but before certification. "Significant new information" requiring recirculation include:

- A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.
- A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.
- A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.

- The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

Section 15088.5 states that recirculation is not required where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR.

Based on the information contained in this chapter, especially sections **9.4 Master Responses** and **9.5 Response to Comments** none of the recirculation thresholds described in section 15088.5 are met. Recirculation of the *Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report,* therefore, is not required.

9.2 VEGETATION AND BIODIVERSITY MANAGEMENT PLAN REVISIONS

Table 1.1 (*Summary of Governing Plans, Guidelines, and Policies Related to Vegetation Management*) in the draft VBMP summarizes the several Marin County governing plans and policies as they relate to vegetation management. ***Chapter 4.0 Relationship to Public Plans*** of the Draft TPEIR presents a comparative analysis of the Draft VBMP's relationship to the relevant guidelines and policies of the public plans that govern MCOSD preserves. The public plans and other policy documents applicable to the MCOSD preserves evaluated in chapter 4.0 are as follows:

- Marin Countywide Plan
- Marin County Parks and Open Space Strategic Plan
- MCOSD Policy Review Initiative
- MCOSD Resource Management Plan Framework
- Marin County Local Mitigation Plan

In response to comments on the *Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report* the draft VBMP has been revised to incorporate additional policies that will direct MCOSD's vegetation management activities: The additional policies are presented below.

FRAMEWORK FOR VEGETATION AND BIODIVERSITY MANAGEMENT

A COMPREHENSIVE APPROACH TO VEGETATION MANAGEMENT

The additional policies in this subsection of the Draft VBMP are as follows:

Comprehensive-1 – *Emphasize High Value Resources*. The MCOSD will emphasis protecting and improving the condition and resiliency of high-value resources, while protecting public safety.

Comprehensive-2 – *Use Management Objectives*. The MCOSD will manage vegetation types and habitats for diversity, richness, complexity, and connectivity across the MCOSD preserve.

Comprehensive-3 – *Manage Vegetation Threats*. The MCOSD will manage vegetation to reduce the threats to natural systems posed by invasive species, unnatural fire events, and pathogens that may take advantage of already stressed species.

Comprehensive-4 – *Use Best Available Science*. The MCOSD will use current scientific information to manage vegetation and reduce threats to the natural system.

PROGRAM COORDINATION AND PRIORITIZATION

The additional policies in this subsection of the Draft VBMP are as follows:

Prioritization-1 – *Establish Vegetation Zones*. The MCOSD will classify vegetation on open space preserves into four vegetation zones: Legacy, Sustainable Natural Systems, Natural Landscape, and Highly Disturbed Zones.

Prioritization-2 – *Emphasize Highest Biological Value*. The MCOSD will prioritize vegetation management activities by zone, with the highest priority on protecting and restoring habitat in the Legacy Zone.

Prioritization-3 – *Consider Timing*. The MCOSD will schedule its vegetation management activities to correspond with natural biological cycles.

INVENTORY, ASSESSMENT, AND MONITORING

The additional policies in this subsection of the Draft VBMP are as follows:

Inventory-1 – Monitoring. The MCOSD will conduct the following assessments to inform decision-making and to allow for adaptive management:

a) Comprehensive baseline inventory of high-value resources and threats of existing preserves and for new acquisitions
b) Periodic rapid assessments to detect emerging management issues
c) Monitoring to assess the efficacy of specific projects

NATURAL RESOURCE MANAGEMENT

The additional policies in this subsection of the Draft VBMP are as follows:

Natural Resources-1 – *Protect High-Value Resources*. The MCOSD will strive to protect high-value resources, based on vegetation zoning.

Natural Resources-2 – *Protect High-Value Vegetation Types by Limiting Public Access*. The MCOSD will strive to direct visitors away from areas of high-value vegetation types to prevent disturbances and adverse impacts.

Natural Resources-3 – *Protect Core Areas and Wildlife Connectivity*. The MCOSD will strive to preserve large, unfragmented areas of natural vegetation and connectivity to help maintain wildlife movement, species diversity, and abundance.

Natural Resources-4 – *Project Timing*. The MCOSD will schedule maintenance activities to reduce potential impacts to special status species and protect nesting birds.

Natural Resource-5 – *Assess Lands within the Highly Disturbed Zone*. The MCOSD will assess lands within the Highly Disturbed Zone on a regular basis to look for trespass, garden plant introductions, green waste dumping, and invasive weeds spread.

Natural Resources-6 – *Restoration*. The MCOSD will strive to restore high-value habitat through the following:

a) Identifying declines in vegetation types

b) Managing invasive plants

c) Removing or realigning and trails away from high value biological resources

d) Restoring native vegetation

e) Identifying opportunities to reintroduce extirpated plants

Natural Resources-7 – *Wildlife Corridors*. The MCOSD will strive to increase habitat connectivity to create wildlife corridors by minimizing intrusions into larger contiguous habitat areas and through the acquisition of fee title or easements on land that will help connect preserves.

INVASIVE PLANT CONTROL AND INTEGRATED PEST MANAGEMENT

The additional policies in this subsection of the Draft VBMP are as follows:

Invasive-1 – Spread of Weeds. The MCOSD will strive to prevent the introduction and spread of invasive species by:

a) Avoiding land disturbance
b) Implementing best management practices
c) Encouraging adjacent landowners to help control invasive plants

Invasive-2 – Pioneer Infestation. The MCOSD will strive to eradicate pioneer invasive plant infestations in all zones.

Invasive-3 – IPM, The MCOSD will use an Integrated Pest Management (IPM) approach to control, contain, or eradicate plant infestations and to reduce herbicide use over time.

FIRE RISK MANAGEMENT AND FIRE HAZARD REDUCTION STRATEGIES

The additional policies in this subsection of the Draft VBMP are as follows:

Fire-1 – Defensible Space. The MCOSD shall place a high priority on fuel reduction in defensible space zones.

Fire-2 – Cooperation. The MCOSD shall cooperate with the Marin County Fire Department and local fire agencies to identify the required defensible space zones within lands that it manages and pose a wildfire threat due to an accumulation of fuel.

Fire-3 – Compliance. The MCOSD will work with the Marin County Fire Department, local fire agencies, community organizations, homeowner associations, and individual property owners to encourage compliance with building and fire codes in defensible space zones.

Fire-4 – Wildfire Ignition Areas. The MCOSD will identify those areas (e.g. located adjacent to development, used by the public, or occupied by other agencies or utilities) where there is a high risk of wildfire ignition.

Fire-5 – High Fire Periods. The MCOSD shall take appropriate actions to minimize the risk of wildfire ignition during periods of high fire danger, which may include prohibiting vehicle access, closing trails and picnic areas, or closing entire areas to all human activities until the fire danger has subsided.

Fire-6 – Prioritize fuel Modification Zones. The MCOSD shall work in collaboration with the Marin County Fire Department and local fire agencies, public land management agencies, and other stakeholders to identify and prioritize locations for fuel modification zones.

Fire-7 – Ingress/Egress Zones. The MCOSD shall strategically locate ingress/egress zones (areas adjacent to fire roads with modified vegetation) to allow for passage of firefighting and rescue vehicles.

Fire-8 – Treatment Plans. The MCOSD shall develop plans for the treatment of fuel modification zones to ensure the:

a) treatment methods are most appropriate to the site conditions and specific project goals
b) detection and elimination of invasive plants occurs prior to construction
c) inclusion of post-construction maintenance and monitoring requirements

Fire-9 – Non-Essential Fuel Breaks. The MCOSD shall work with Marin County Fire Department and local fire agencies to identify and restore nonessential fuelbreaks and fire roads to natural conditions or convert the nonessential roads to trails.

Fire-10 – Staff Capacity. The MCOSD shall strive to maintain staff capability to respond to large wildfires in order to support fire suppression authorities, to assist in the planning of suppression efforts within a preserve, help reduce natural resource damage, and provide input to the incident management team.

Fire-11 – Fire Rehabilitation. The MCOSD shall maintain coordination activities after containment or control of a wildfire within a preserve to provide input for conducting both fire rehabilitation and post fire mitigation efforts.

FOREST HEALTH MANAGEMENT

The additional policies in this subsection of the Draft VBMP are as follows:

Forest-1 – Diseased Tree Hazards. The MCOSD shall manage hazards associated with weakened or diseased trees in high-use areas by:

a) inspecting preserves regularly to identify hazard and pathogen infestations
b) removing or treating priority hazard trees

Forest-2 – Forest Pathogens. The MCOSD shall selectively treat forest pathogens depending on the treatment available, impacts to other trees and the forest, and the condition of the forest.

Forest-3 – Monitoring. The MCOSD shall monitor forest pathogens and set a threshold for triggering pest control.

Forest-4 – Regional Efforts. The MCOSD shall participate in regional efforts to control and treat forest pathogens.

Forest-5 – Non-Native Trees. The MCOSD shall manage native forests and woodlands in the legacy and sustainable natural systems zones to ensure that nonnative trees do not:

a) substantially change the dominant tree types
b) alter or reduce functions (e.g., shade, cover, forage)
c) alter the structure (e.g., characteristic overstory, midstory, understory layers) of the forest type

Forest-6 – Douglas Firs. The MCOSD shall contain native Douglas-fir trees within the footprint of the existing mature stands in order to control their spread into surrounding habitats and to reduce fire fuels.

Forest-7 – Low Use Areas. The MCOSD shall limit active vegetation management in low-use areas, such as inaccessible forest interiors.

MANAGEMENT OF VEGETATION RESPONSES TO CLIMATE CHANGE

The additional policies in this subsection of the Draft VBMP are as follows:

Climate-1 – Greenhouse Gasses. The MCOSD shall consider the effects of vegetation management on greenhouse gasses.

Climate-2 – Monitoring. The MCOSD shall expand its monitoring and adaptive management to support response to climate change.

Climate-3 – Climate Change Response. The MCOSD shall design restoration projects to facilitate vegetation shifts in response to changing climate conditions by:

a) increasing genetic diversity in restoration plantings
b) planting vegetation across a range of microclimates and elevations within the restoration area

Climate-4 – Wetland Loss. The MCOSD shall offset the loss of coastal wetlands to sea level rise by supporting replacement wetlands in new locations.

Climate-5 – Cooperation. The MCOSD shall cooperate with other agencies and researchers to understand and address the effects of climate change.

ADDITIONAL REVISIONS TO DRAFT VBMP

CHAPTER 1: PROJECT INITIATION

Purpose of the Vegetation and Biodiversity Management Plan (VBMP p. 1.5)

The primary purpose of this *Vegetation and Biodiversity Management Plan* for the Marin County preserves is to provide comprehensive, long-term guidance for a new science-based approach to vegetation management that will (1) maintain the natural biodiversity of the vegetation within the preserves, (2) maintain patrol, emergency and public access, and (3) manage fuel loads to reduce the threat of natural and human-caused fires. The VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to vegetation management in order to improve the program's effectiveness and efficiency. This guidance document leaves project-specific decisions to the implementation stage. The plan relies on the current practices of the MCOSD as a basis for any discussion of specific projects or treatment methods. This comprehensive plan will replace existing preserve-specific vegetation plans, expanding the geographic scope of vegetation management to include all of the MCOSD preserves, and coordinating management actions based on shared goals and objectives. As a long-term plan, it will provide a foundation for replacing year-to-year program fluctuations with a more systematic and consistent approach to priority setting, budgeting, staffing, and partnering with other entities, which will further improve efficiency and effectiveness over the long term. This plan is not prescriptive. Rather it is a vehicle for decision making about vegetation management projects on the MCOSD lands.

~~PURPOSES~~ Goals and Objectives of the Vegetation and Biodiversity Management Plan (VBMP p. 1.5)

Governing and Guidance Documents (VBMP pp. 1-6 – 1-8

Table 1.1 Summary of Governing Plans, Guidelines, and Policies Related to Vegetation Management

Systemwide Planning and Policy Documents, County Codes	Guidance Relevant to Vegetation Management	
Marin Countywide Plan (2007)	Relevant Guiding Principles:	
	1	A Preserved and Restored Natural Environment: Marin watersheds, natural habitats, wildlife corridors, and open space will be protected, restored, and enhanced.
	2	Collaboration and Partnerships: Marin public agencies, private organizations, and regional partners will reach across jurisdictional boundaries to collaboratively plan for and meet community needs.
	3	A Community Safe from Climate Change: Marin will be a leader in averting and adapting to all aspects of climate change.
	Pertinent Goals and Policies:	
	BIO-1	Enhanced Native Habitat and Biodiversity: Effectively manage and enhance native habitat, maintain viable native plant and animal populations, and provide for improved biodiversity throughout the County.
	BIO-2	Protection of Sensitive Biological Resource: Require identification of sensitive biological resources and commitment to adequate protection and mitigation, and monitor development trends and resource preservation efforts.
	BIO-4	Riparian Conservation: Protect and, where possible, restore the natural structure and function of riparian systems.
Marin County Strategic Plan (2001)	The *Marin County Strategic Plan* contains the basic framework for the mission statement, goals, and strategies for Marin County Open Space.	

Systemwide Planning and Policy Documents, County Codes	Guidance Relevant to Vegetation Management	
Marin County Department of Parks and Open Space Strategic Plan (2008)	Pertinent ~~Fire Policies~~ Goals:	
	Goal -1	Protect and Restore Our Lands: Protect, restore, and preserve the natural systems of the lands held in trust for current and future generations.
	Goal -2	Grow and Link the County's Systems of Parks, Trails, and Protected Lands: Complete the county's system of parks, open space, and trails. Support the efforts of other agencies, organizations, and communities to fulfill their land preservation and system goals.
	Goal -3	Foster Discovery, Learning, and Stewardship: Engage the community by providing volunteer and educational experiences for people to discover, learn about, protect, and restore their parks and open spaces.
	Goal -5	Lead, Innovate, and Partner: Cultivate partnerships, explore new approaches, and adopt best practices and technologies.
Marin County Open Space District Policy Review initiative	Pertinent Fire Policies:	
	F-1	The MCOSD shall strive to reduce fire hazards on its lands in partnership with local fire agencies and communities, in recognition of the importance of wildfire prevention to every Marin County resident.
	F-2	The MCOSD shall strive to plan and conduct fire fuel reduction activities in a manner that protects natural resources.
	F-3	MCOSD shall participate in countywide fire hazard reduction planning.
	F-4	MCOSD shall assess fire hazard conditions when acquiring new lands and in land management planning.
	F-5	MCOSD shall determine annual fire fuel reduction priorities on its lands, in consultation with Marin County's fire agencies.
	F-6	MCOSD shall consider the use of prescribed burns, grazing, and other fire hazard reduction practices to reduce fire hazard and restore or maintain native ecosystems.
	F-7	MCOSD shall encourage adjoining property owners to create defensible space surrounding homes and other improvements.
	F-8	MCOSD shall strive to resolve issues of defensible space in cooperation with Marin County fire agencies, planning authorities, and communities.
	Pertinent Invasive Plant and Wildlife Policies:	
	NN-1	MCOSD shall strive to reduce populations of nonnative species for the benefit of native habitats and species.
	NN-2	MCOSD should collaborate with public agencies, nongovernmental organizations, and landowners in regional and countywide planning to reduce populations of invasive species.
	NN-3	MCOSD shall inventory populations of, establish control priorities for, and develop control strategies for nonnative species.
	NN-4	MCOSD should minimize the unintentional introduction of nonnative species.
	NN-5	MCOSD should support and participate in research concerning the control of nonnative
	NN-6	MCOSD shall accommodate remnants of nonnative species when they contribute to historic and cultural landscapes.
	Pertinent Special Status Species Policies:	
	SS-1	MCOSD shall protect and enhance the habitats of indigenous plants and animals. Those whose survival is threatened, endangered, or tenuous, or whose regional presence is rare, shall be given special protection. Such plants and animals shall be referenced in the following policies as special- status species.
	SS-2	MCOSD should partner with public agencies, nongovernmental organizations, and landowners in regional and countywide efforts to inventory special status species and to develop regional habitat conservation plans that protect special status species, wildlife corridors, ecosystems, and biodiversity.
	SS-3	MCOSD shall develop strategies to protect special status species and their habitats, including strategies to resolve conflicts between public use of District lands and the protection of special- status species and their habitats.
	Pertinent Public Outreach Policies:	

Systemwide Planning and Policy Documents, County Codes	Guidance Relevant to Vegetation Management	
	PO-1	MCOSD shall conduct public outreach to inform Marin County residents and open space visitors of its mission, lands, resources, and programs; to enhance visitor appreciation and the educational value of open space; to encourage compliance with the Open Space District Code; and to promote good relations.
	PO-2	MCOSD shall encourage public participation in its decision-making processes and, specifically, encourage the participation of neighborhoods and communities in discussions of issues affecting their interests.
	PO-3	MCOSD shall direct its public outreach primarily to Marin County residents.
	PO-4	MCOSD shall accommodate non-English speaking visitors by providing outreach in multiple languages.
Marin County Integrated Pest Management Ordinance (2009)	The "Marin County Integrated Pest Management (IPM) Ordinance" (chapter 23.19 of the *Marin County Code*) directs IPM practices to be implemented by all county departments performing pest management. The MCOSD, as a special district within the county, does not fall under the existing IPM ordinance; however the MCOSD has voluntarily met the notification requirements of the ordinance for relevant projects on open space lands. The ordinance specifies the creation of the Integrated Pest Management Commission and requires reduction of pesticide use and established pesticide-free zones at playgrounds and landscape areas of health care facilities. The ordinance is amended to include several additional parameters on how to implement IPM practices and on how the public accesses information about pesticide use. The ordinance provides a partial list of pesticides intended for use on county lands that meet all criteria for IPM compliance, possibly expediting the approval process for projects that use these pesticides and herbicides and follow IPM procedures. Among the approved pesticide and herbicide list are plant family-specific herbicides. The ordinance defines the process by which other pesticides and herbicides, not identified on the list, will be evaluated and selected based upon future requests.	
Marin County Fire Management Plan (2008)	The Marin County Fire Management Plan Identifies and describes countywide fire hazard management strategies. The plan recommends constructing 70 miles of additional fuelbreaks, including many on MCOSD lands; clearing stands of nonnative trees; and trimming roadside vegetation to reduce fuel loads. The plan includes fuelbreak construction guidelines and fuel-reduction strategies. It includes a fuel hazard assessment and ranking system, with supporting tables and maps. The plan specifies some invasive plant control requirements for broom, including the requirement that broom control be conducted using an integrated pest management approach. Suggested possible treatments include pulling, cutting, burning, and spraying, alone or in combination, for 1 to 3 years, followed by hand pulling of seedlings once general control is achieved.	
Marin Sonoma Weed Management Area Strategic Plan (2003)	The Marin Sonoma Weed Management Area Strategic Plan outlines goals to (1) increase the effectiveness of invasive plant management programs, (2) increase public awareness, and (3) advance knowledge of good land stewardship and integrated pest management practices for noxious and invasive plant management, to be achieved through the collaborative efforts of the 18 partners, including MCOSD.	
Memorandum of Understanding for the Establishment of a Weed Management Area for the Counties of Marin/Sonoma (2003, updated 2009)	The memorandum of understanding establishes a Marin/Sonoma Weed Management Area (MSWMA), which includes Marin County and southern Sonoma County watersheds. The memorandum proposes that members work cooperatively with willing landowners and managers to develop and implement an integrated, ecological approach to the management of noxious weeds and other invasive plants. It further proposes that members work together within the scope of their respective authorities toward a common goal of achieving sustainable, healthy ecosystems that meet the needs of signatory members and stakeholders.	

Goals for the Vegetation ~~and Biodiversity~~ Management Program ~~Plan~~ (VBMP p. 1-8)

Currently, the MCOSD's manages its vegetation management program on an ad hoc basis. ~~Through the development and implementation of~~ This plan will provide the MCOSD ~~will work to achieve~~ with five new broad goals for ~~the vegetation management~~ this program. These goals are intended to conform with or achieve existing policies, goals, and objectives already developed by Marin County (as illustrated in table 1.2), with a vision for strategically moving the vegetation management program forward into the future. These goals provide general guidance to the MCOSD are not prescriptive requirements for individual projects or treatment methods.

Summary of the Planning Process and Document Overview (VBMP p. 1-11)

Plan Implementation: Chapter 5

- ~~Identify specific projects for implementing the plan.~~

- Identify examples of projects that the MCOSD could use to implement the plan.

- Describe the processes to be used in project planning and priority setting.
- Describe the role of volunteers in plan implementation.

CHAPTER 2: PRESERVE CONDITIONS: INVENTORY AND ASSESSMENT

Table 2.1 Summary of Preserve Conditions (VBMP p. 2-23)

Ring Mountain Area = 367.2 acres Perimeter = 6.1 miles	Sensitive Vegetation Type(s): • Cliffs, rock outcrops (S) • Mesic trending chaparral (S) • Purple needlegrass perennial grasslands(F) • Rocky serpentine grasses (S) • Sedge, rush, wet graminoids meadow (W) • Serpentine grassland (F) • Temporarily flooded or saturated meadow edge (w) • Upland serpentine grassland (G2) • Valley oak, coast live oak (S) • Wetland serpentine grassland (W) Wetlands: • East Creek • West Creek • Three other unnamed creeks • Riparian woodlands Other: • Mineral lawsonite first discovered here in the 1890s.	Special-Status Plants: • *Calochortus tiburonensis* (Tiburon mariposa lily), C • *Calochortus umbellatus* (Oakland star-tulip), C • *Castilleja affinis* ssp. *neglecta* (Tiburon indian paintbrush), C • *Eriogonum luteolum* var. *caninum* (Tiburon buckwheat), C • *Hesperolinon congestum* (Marin dwarf flax), C • *Trifolium amoenum* (showy Indian clover), R was present before 1970, presumed extirpated • ~~*Trifolium buckwestiorum* (Santa Cruz clover), R~~ Special-Status Wildlife: • *Accipiter cooperi* (Cooper's hawk), C • *Ammodramus savannarum* (grasshopper sparrow), C • *Taxidea taxus* (American badger), C • *Microcina tiburona* (Tiburon micro-blind harvestman), R • *Elanus leucurus* (white-tailed kite), C • *Burrowing Owl*, (Athene cunicularia), C	*Foeniculum vulgare* (fennel) is increasing rapidly and threatens rare plant populations. Large stands of *Rubus armeniacus* on northern slopes and some drainages on southern portion of the site. Argentine ants may displace sensitive organism such as Tiburon blind harvestman. Tiburon buckwheat is severely threatened (LSA 2008). Important invasive plants include: • Genista monspessulana (French broom) • *Centaurea solstitialis* (yellow starthistle) • *Elytrigia pontica* (tall wheatgrass) • *Maytenus boaria* (mayten) • *Centaurea calcitrapa* (purple starthistle)	Earliest Miwok village dated to 370 BC. Part of Reed Ranch for 130 years until 1965. Army installed guns on summit in 1950s, deactivated in 1960s. Management turned over to MCOSD in 1995 from Nature Conservancy. Town of Tiburon owns several significant adjacent properties.	Staff has worked with volunteers to treat a long list of invasive plant species at several sites across the preserve. These ongoing efforts have been very successful.	

CHAPTER 3: ASSESSMENT OF REGIONAL TRENDS, PRACTICES, AND SCIENCE (VBMP P. 3-1)

The information in this chapter synthesizes regional trends and evaluates current practices in the area of vegetation management. ~~This information will be used to guide the MCOSD's decision making process when implementing this *Vegetation and Biodiversity Management Plan*.~~ This information is a compendium of existing practices by land management agencies and existing science that the MCOSD will use to support its evaluation of resource management issues. The information was compiled through a review of published and unpublished literature, and through interviews with vegetation ecologists and fire management professionals from public agencies and private organizations throughout the Bay Area, that included: …

Treatments (VBMP p. 3-16)

This section surveys the agencies' implementation of the principles of integrated pest management (IPM) and discusses the components of their invasive plant treatment programs, including planning and prioritization, treatment methods, timing, and consideration of environmental and human health and safety issues. Additionally, this section only describes the practices of other agencies, and does provide a prescription for the MCOSD's practices.

Successful treatment of invasive plants on the MCOSD preserves will require land managers to use ~~a variety of treatments~~ IPM approach, similar the approach currently used by the MCOSD. The agencies interviewed expressed that the key to successful control is having the flexibility to select and adapt many treatment methods to a site-specific situation. Integrated pest management is a process that enables flexible decision making and requires agencies to carefully consider and balance the multiple objectives of protecting biological diversity, reducing fire risk, protecting and restoring native plant communities and special status species, and ensuring environmental and human health and safety.

Environmental and Human Health and Safety Considerations (VBMP pp. 3-23 – 3-24)

MMWD has conducted a thorough investigation of environmental and human health and safety considerations that are to be considered in their vegetation management program (MMWD 2009b, 2008a). The following list of "components of public health and environmental impacts to be considered (in alphabetical order)" is excerpted from MMWD (2008a):

The MCOSD will continue to consider these health and safety factors in its IPM approach ~~factors in its decision making~~.

CHAPTER 4: FRAMEWORK FOR VEGETATION AND BIODIVERSITY MANAGEMENT PLAN

A Comprehensive Approach to Vegetation Management (VBMP p. 4-1)

This chapter is based on the evaluation of the existing practices of the MCOSD and other land management organizations and on the best available current science. The purpose of this chapter is to provide high-level strategy to prioritize the MCOSD's vegetation management program. The specific treatment methods will be determined during project implementation based on the best current science and site- and project-specific constraints. The vegetation management program for the MCOSD preserves will place the greatest emphasis on protecting and improving the condition and resiliency of high-value resources, while recognizing the priority of public safety . Vegetation types and habitats will be managed for diversity, richness, complexity, and connectivity across the MCOSD preserves, recognizing that adaptation to global climate change will be most successful for healthy natural systems. Management to reduce the threats to natural systems posed by invasive species, unnatural fire events, and pathogens that may take advantage of already stressed species will be an integral part of this management. Rather than reacting to threats as they arise, emphasis will be placed on proactively working to reduce the causes of these threats, based on the most current scientific information about effective procedures and on standardized best management practices.

Invasive Plant Control and Integrated Pest Management (VBMP p. 4-33 – 4-34)

Table 4.4 Priority Invasive Plants

Scientific Name	Common Name	Preserves infested**	Total Acres Mapped**	State Noxious Weed Rating	Cal-IPC Rating	Status on MCOSD Lands
Acacia decurrens, Acacia melanoxylon, other *Acacia spp.*	Acacia, black wattle, blackwood acacia	~~5~~ 14	~~0~~ 31	N/A	Limited (*A. melanoxy-lon*), N/A	Limited distribution, high impacts

The MCOSD ~~invasive species management is guided by the Marin County Integrated Pest Management Ordinance~~ currently uses an IPM approach to treat invasive plants on its preserves. Through this plan, the MCOSD will continue to use such an approach based on current practices and science.. Integrated pest management takes advantage of all appropriate invasive plant management options, including but not limited to hand removal, mechanical removal, cultural practices, and the judicious use of herbicides. Integrated pest management is not a single invasive plant control method, but rather a series of invasive plant management evaluations, decisions, and controls.

Table 4.6 Invasive Plant Treatment Decision-Making Matrix

Factors		Rank Range	MCOSD Weight-ing Factor	Rank Score	Weight-ed Score
Section 1. Containment and Control Benefits					
Likelihood of treatment effectiveness	Highly likely to eradicate	10	3		
	Moderately likely to eradicate or control	5			
	Low likelihood of success	1			
Proximity of invasive species to sensitive natural resources	Within population/habitat	10	3		
	Within 100 feet of population/habitat	5			
	Within 1,000 feet of population/habitat	1			
Initial treatment cost per acre	High - > $15,000	1	3		
	Moderate - $5,000-$14,999	5			
	Low - < $5,000	10			
Maintenance cost per acre (assume cost per year for 5 years)	High - > $3,000/ per year	1	3		
	Moderate - $2,999-$1,000/per year	5			
	Low - < $1,000/per year	10			
Density of invasive plants	Dense invasive plants	1	2		
	Moderate invasive plants	3			
	Sparse invasive plants	4			
	Little or no invasive plants present	5			
Possible dual benefit to fuel management	High benefit - located in a designated fuel management zone	10	2		
	Moderate benefit- outside but adjacent to a designated fuel management zone	5			

Factors		Rank Range	MCOSD Weight-ing Factor	Rank Score	Weight-ed Score
	Low benefit- not much benefit to fuel management efforts	1			
Need for specialized skills/ treatments	Can be accomplished with existing staff/volunteers, high # of treatment options	10	2		
	Requires specialized skills to control, low # of treatment options	1			
Potential ~~impacts~~ benefits to rare, threatened and/or endangered species	High	~~1~~ 10	3		
	Low/none	~~10~~ 1			
Subtotal Containment and Control Benefits Score					
Section 2. Environmental Concerns/~~Benefits~~					
Potential impacts to cultural resources	High	1	2		
	Moderate	3			
	Low/none	10			
Potential ~~benefits~~ impacts to sensitive natural resources	High	1	2		
	Moderate	3			
	Low/none	10			
Erosion /visual impacts	Will not result in substantial soil disturbance, work not visible for roads or trails	10	2		
	Work may result in some localized soil disturbance work partially visible from roads or trails	5			
	Work likely to result in widespread soil disturbance, work site open and exposed	1			
Linkage to adjacent existing fuel management areas	Over 1 mile	1	2		
	Within 1 miles	2			
	Within 0.5 miles	5			
	Within less than 0.25 miles	10			
Subtotal Environmental Concerns/Benefits Score					
Total Project Score (section 1 score + section 2 score)					

Generally Utilize Multiple Types of Treatment over Multiple Years (VBMP p. 4-43)

The ~~recommended~~ potential treatment options for invasive plants known to exist in the MCOSD preserves are discussed below and listed in table 4.7. The VBMP includes these methods, and the discussion below, as potentially treatment actions to assist the MCOSD in developing specific weed-management projects. The MCOSD will use an IPM approach that considers chapter 4 of the VBMP, including table 4.7, and other recommendations to develop an effective treatment program that minimizes harm to the environment. ~~For many species, mechanical control followed by chemical control is expected to be the most effective for treating large and well-established infestations. Cutting followed by some sort of localized herbicide application (e.g., cut-and-paint application, low-volume drizzle foliar application, low-volume basal bark application) is considered both low cost and highly effective.~~

Invasive Trees (VBMP p. 4-44)

Several invasive trees on the MCOSD preserves are becoming problematic because they are displacing native vegetation and are spreading from landscaped areas into wildlands. Invasive trees that are problems on the MCOSD preserves include

- acacia (Acacia decurrens, A. melanoxylon, other Acacia spp.)
- blue gum eucalyptus (Eucalyptus globulus)
- Monterey cypress (Cupressus macrocarpa)
- Monterey pine (Pinus radiata)
- Chilean mayten (Maytenus boaria)
- Tree of Heaven (Ailanthus altissima)

Criteria for controlling invasive trees are described under "Forest Health." When the threshold for control is met, the following treatment will be conducted by the MCOSD staff or contracted through a licensed and bonded professional ~~aborist~~ arborist with experience working in wildland settings. In developing an IPM-based treatment project, the MCOSD will consider the following elements to address invasive trees:

Invasive Shrubs (VBMP pp. 4-46 – 4.47)

All of these species are perennials that reproduce primarily by seed; however, some also spread vegetatively by underground roots or canes (e.g., cotoneaster). Many of these species can also sprout from underground roots or stumps (stump-sprouting) after being cut (e.g., Scotch broom, Spanish broom, French broom, cotoneaster). Consequently, follow-up treatments are essential for successful control. In developing an IPM-based treatment project, the MCOSD will consider the following elements to address invasive shrubs:

4. Selection of treatment methods: Prior to the start of work, staff will select methods to be employed during shrub removal. Refer to table ~~4.6~~ 4.7 for treatment options.

5. Flush cutting stumps: The remaining stumps will be flush cut to near ground level (no more than 6 inches above the ground surface). ~~Cut stumps may be immediately painted with an appropriate herbicide to prevent resprouts.~~

9. Follow-up treatments for resprouts, seedlings: A series of well-timed follow-up control treatments are critical to controlling resprouting shrubs. Refer to table ~~4.6~~ 4.7 for treatment options. Retreatments should be less intensive over time as the seed bank is exhausted, eventually resulting in either sustained control or full eradication of the species from the treatment area. Staff and volunteers have found the following follow-up treatment regime to be effective in treating resprouts and seedlings:

Invasive Perennial Vines (VBMP p. 4-48)

Cape Ivy is a perennial vine that reproduces vegetatively by stems that root at the nodes and sexually by seed. Cape ivy is considered problematic on some of the MCOSD preserves. In developing an IPM-based treatment project, the MCOSD will consider the following elements to address perennial vines:

3. Selection of control methods. Prior to the start of work, staff will select methods to be employed during vine and cane removal. Successful removal methods can include cutting back canes and digging out roots, brushcutting, and cutting and treating with herbicides. Refer to table ~~4.6~~ 4.7 for treatment options.

Invasive Thistles and Thistlelike Plants (p.4-49)

These species tend to rapidly colonize disturbed areas and are capable of infesting undisturbed sites once established in a disturbed area nearby. The most important principle in treating the plants is to avoid creating soil disturbance. Other land managers have observed that their largest and fastest growing infestations are associated with fuelbreaks, fire roads, and trails that are scraped, disked, or otherwise disturbed (refer to findings in chapter 3). Preventing disturbance where these plants are present, or removing them before and after disturbance, can mitigate the need for expensive and ongoing controls and can prevent the creation of seed sources which can harm adjacent vegetation types and properties. In developing an IPM-based treatment project, the MCOSD will consider the following elements to address invasive thistles and thistle-like plants:

Invasive Perennial Grasses (VBMP p. 4-49)

An important principle for successfully treating perennial grasses is that treatments must kill the seed heads as well as the shoots and meristems that are clustered just above or below the soil surface and which can reproduce vegetatively. To ensure control, sites must be revisited for follow-up treatment at regular intervals for the first two to four years. In developing an IPM-based treatment project, the MCOSD will consider the following elements to address invasive perennial grasses:

Invasive Annual Grasses (VBMP pp. 4-49 – 4-50)

Invasive annual grasses are ubiquitous in most ~~vegetataion~~ vegetation communities in Marin. Annual grasses survive the dry summers in the seed stage, giving them an advantage over perennials, especially in dry years. Annual grasses, present on all of the MCOSD preserves are difficult to eradicate, but an attempt should be made to at least control them in sensitive habitats. In developing an IPM-based treatment project, the MCOSD will consider the elements below to address invasive annual grasses. Invasive annual grasses known to be problematic on the MCOSD lands include:

- foxtail brome (Bromus madritensis)
- Italian ryegrass (Festuca perennis (=Lolium multiflorum))
- barbed goatgrass (aegilops triuncialis)
- medusa head (Elymus ~~Taeniatherum~~ caput-medusae)
- ~~rattlesnake grass (Briza maxima)~~
- wild oats (Avena spp.)

Other Invasive Species (VBMP p. 4-50)

For all target invasive plants that do not fall into a broad treatment category, the MCOSD staff will contact California Invasive Plant Council (CalIPC), other land management agencies, and the Agricultural Commissioner's Office to determine an appropriate course of treatment, based on population size and density, location, proximity to sensitive biological resources and human populations, and efficacy of available treatments. Refer to table 4.7 for recommended treatment options. In most cases, more than one treatment type will be required to fully eradicate or control the species. The treatment options described in Table 4.7 are possible options and MCOSD will use its IPM process to determine the most appropriate treatment option for the specific situation.

Table 4.7 (VBMP p. 4-51)

Table 4.7 Recommended Potential Treatment Options for Target Invasive Plants

Scientific Name (Common Name)	~~Recommended~~ Potential Treatments Options for Target Invasive Plants
Phalaris aquatica (harding Grass)	**Hand and Machine Control Methods** • Removing individual adult plants by digging root ball with shovel or Pulaski is reported moderately effective. Small plants may be removed with hand pick or hoe. Soil disturbance may promote germination of seeds so requires follow-up treatment. **Chemical Control Methods** • Foliar application of Roundup Pro, Aquamaster, or Fusilade in late spring/early summer. **Other Treatment Methods** • Use of water high-pressure washer (hydro-mechanical obliteration)14 reduces biomass but has limited application, with greatest efficacy in riparian areas.
Spartina alterniflora (cordgrass)	**Hand and Machine Control Methods** • Individual plants or small infestations can be eliminated by digging with shovel to remove plants and root ball. **Chemical Control Methods** • Foliar application of Aquamaster is reportedly effective at controlling plants and eliminating infestations. However, this treatment is constrained by seasonality, timing of tides (e.g., low or receding low tides in the morning), and presence of mud on plant leaves. • Foliar application of Habitat to actively growing shoots in mid-July is reportedly an effective treatment for controlling plants and eliminating infestations. This treatment is more effective than Aquamaster.
~~*Taeniatherum caput-medusae* (Medusa-head)~~	~~**Hand and Machine Control Methods**~~ ~~• Mowing alone, or in combination with grazing, was found to be effective in reducing infestations.~~ ~~**Chemical Control Methods**~~ ~~• Small infestations can be controlled by foliar application of glyphosate products or imazapyr in fall and/or spring.~~ ~~**Other Treatment Methods**~~ ~~• Intensive grazing has been shown to reduce small populations, however the timing window is narrow and the stocking rates are high.~~
Annual Grasses	
Aegilops triuncialis (barbed goatgrass)	**Hand and Machine Control Methods** • Hand pulling is reportedly effective for eliminating small or sparse infestations, but has limited applications (expensive, time- and labor-intensive). • Mowing using string trimmers can be effective. However, timing is critical. Mowing should occur after flowering, but before goatgrass seeds reach the soft boot stage. Early mowing will result in new tiller growth and late mowing will only spread viable seed. • Recommend MCOSD natural resource staff work with work crews to make sure treatment timing is optimal. **Chemical Control Methods** • Foliar application of Envoy in spring after germination and before seed heads emerge. • Foliar application of Fusilade in spring after germination and before seed heads emerge (less successful than use of Envoy). Site-specific conditions may be responsible for variable outcome. • Foliar application of Roundup Pro effective in spring after tillering but before flowering. **Other Treatment Methods** • Two consecutive late spring prescribed burns15 can significantly reduce abundance of barbed goatgrass. • Early summer burn but only before grass joints disarticulate to ensure seed kill has resulted in some success.

Scientific Name (Common Name)	~~Recommended~~ Potential Treatments Options for Target Invasive Plants
Other Annual Grasses including: *Avena Spp (oat grass)* *Bromus madritensis (foxtail brome)* *Festuca perennis (=Lolium multiflorum) (Italian ryegrass)* *Elymus caput-medusae* (Medusa head)	**Hand and Machine Control Methods** • Hand pulling is reportedly effective for eliminating small or sparse infestations, but has limited applications (expensive, time- and labor-intensive). • Mowing using string trimmers can be effective. However, timing is critical. Mowing should occur after flowering, but before seeds reach the soft boot stage. • Recommend MCOSD natural resource staff work with work crews to make sure treatment timing is optimal. **Chemical Control Methods** • Foliar application of grass-specific herbicide in spring after germination and before seed heads emerge. • Foliar application of broad-spectrum herbicide in spring after germination and before seed heads emerge. **Other Treatment Methods** • Consecutive prescribed burns can significantly reduce abundance. • Timed grazing can significantly reduce abundance.
Other Invasive Species	
Ageratina adenophora (croftonweed, thoroughwort, eupatorium)	**Hand and Machine Control Methods** • Hand pull seedlings16 where they occur at low density (i.e., during later stages of eradication effort). **Chemical Control Methods** • Foliar application of Roundup Pro, Aquamaster or Garlon 3A can control seedlings. • Foliar application of Garlon 3A can control mature plants after fruits turn brown. • Low-volume foliar application of Aquamaster or Roundup Pro can control mature plants after fruits turn brown.

Identify and Prioritize Locations for Fuelbreaks (VBMP p. 4-66)

Going forward, the MCOSD will use a combination of strategies that will reduce these impacts. At the same time, while working in collaboration with County Fire and local fire agencies, public land management agencies and other stakeholders, the retention and maintenance of existing fuelbreaks will be evaluated on a case by case basis. In this process, these collaborators will consider and determine what the best course of action is that will both reduce wildfire risk and protect biodiversity.

Treat Fuel Modification Zones (VBMP p. 4-71)

The following treatments may be used individually or in combination with each other. All treatments will be implemented using an IPM approach and the best management practices described in chapter 7.

Maintain Staff Capability to Respond to Large Wildfires (VBMP p. 4-72)

Upon containment/control of a wildfire incident, MCOSD will maintain coordination activities, including input for conducting both fire rehabilitation and Burned Area Emergency Response (BAER) Team mitigation efforts. MCOSD will ensure that all suppression-related materials are removed from MCOSD lands. Fire rehabilitation should include, but not be limited to, the repair of damages to roadways and fences and installation of water bars on tractor lines when there is a concern for soil erosion. At the end of the rainy season, MCOSD will conduct an assessment of the BAER Team's erosion and debris flow mitigation efforts, especially in the defensible space zones and along roadways, where lives or property are threatened by erosion and debris flows. MCOSD may have recoverable costs for BAER Team treatment actions.

CHAPTER 5: PLAN IMPLEMENTATION

Table 5.1 List of Potential Projects to be Implemented (VBMP p. 5-3)

Project Title	Preserve(s)	Descript ion	Estimated Acres Treated
District-Wide Early Detection/ Rapid Response Program Implementation	All - on rotational 3-year cycle as described in Chapter 6	(1) Finalize /update annual list of priority invasive. (2) Train staff on identification of selected priority species. (3) Consider developing outreach program for adjacent landowners who have source populations of invasives that affect MCOSD preserves. Research cost-sharing, concurrent treatment, or providing technical support for offsite control. (4) Develop EDRR watch list for each preserve, update annually. (5) Develop a volunteer-based plant watch program as part of EDRR. (6) Patrol selected preserves as part of a 3-year cycle. (7) Implement control. (8) Update GIS. (9) Continue to monitor treated incipient infestations until either full control or eradication achieved.	15,067
District-Wide Invasive Plant Rapid Assessment	All - focus on invasive plant control projects that are implemented as a part of annual work plan	(1) Update (but not replace) the GIS attribute table for invasive plant infestations being treated. (2) Compare infestation distribution data and density/cover estimates to prior and baseline data layer. (3) Determine hotspots where changes in infestation distribution or density either warrant a change or more aggressive IPM-based action. (4) Update rapid assessment list with any new hotspots and, when appropriate add new priority invasive plant control projects to list.	15,067
District-Wide Barbed Goatgrass Control	Focus control in preserves listed below, adjust locations if new priority locations are identified as a part of the District-wide Target Invasive Plant Mapping Project currently underway	(1) Reassess barbed goatgrass control actions to date using the methods outlined in Chapter 6 within the preserves listed below. Remap and reassess distribution relative to ongoing mowing, fuel management, road/ trail locations, and vegetation management zones, and if applicable grazing. Determine if any of these other actions are affecting spread of the grass and if so, modify methods to reduce potential for spread (example, change mowing schedule to reduce inadvertent spread of goatgrass or discontinue, restrict vehicle access, change grazing leases timing, etc.). (2) Establish a volunteer-based weed watch program to complement control actions- conduct ongoing volunteer EDRR patrol and hand pull throughout the year. (3) Implement maintenance and monitoring program for remaining grass until eradication and/or control is achieved.	60+
	Mount Burdell	Treatment was initiated in 2006; several methods have been investigated to control and eventually extirpate barbed goatgrass from the site. Follow-up treatments have been conducted annually since 2006, but full control has not been achieved.	1.35
	Terra Linda/Sleepy Hollow	Treatment was initiated in 2006; several methods have been investigated to control and eventually extirpate barbed goatgrass from 60 acres of the site. Follow-up treatments have been conducted annually since 2005, but full control has not been achieved.	60
District-Wide Invasive Broom Control	Focus control in preserves listed below, adjust locations if new priority locations are identified as a part of the District-wide Target Invasive Plant Mapping Project currently underway	(1) Reassess French broom (and other broom species) control actions to date using the methods outlined in Chapter 6 within the preserves listed below. Remap and reassess distribution relative to ongoing mowing, fuels management, road and trail locations and if applicable grazing. Determine if any of these other actions are affecting spread of brooms and if so, modify methods to reduce potential for spread (example, change mowing schedule to reduce inadvertent spread, expand wide-area fuel break boundaries to capture infestation edges, or discontinue/alter land use practices (e.g. restrict vehicle access, etc.). (2) Assess if current control/containment locations are highest priority locations for control as outlined in Chapter 6 - add or delete control locations following assessment. (3) Meet with MCFD and other fire agencies to discuss opportunities to conduct dual fuel reduction/invasive plant control projects for broom. (4) Establish a volunteer-based weed watch program to complement control actions- conduct ongoing volunteer EDRR patrol and hand pull throughout the year. (5) Implement follow up maintenance and monitoring program for remaining brooms until eradication and/or control is achieved.	481
	Alto Bowl/Horse Hill	Treatment was initiated in 2003 for this approximately 4.5 acre infestation. The project was initiated by and follow up treatments have been conducted annually by volunteers. Research partnerships with county and local fire departments to cost-share Wide Area Fuelbreak project that includes volunteer opportunities.	4.5
	Cascade Canyon	This project site was initially cut as part of a grant funded fuel reduction effort to install a series of primary fuelbreaks throughout the preserve in 2006. This multi-year project will divide existing broom infestations into containment zones, Wide Area Fuelbreaks, restoration zones (eradication), and volunteer removal sites. Develop a restoration plan that manages fire risk and natural resources. This project requires and IPM-based approach to be successful.	88
	French Ranch	Treatment was initiated in 2008 for this approximately 3 acre infestation. The project was initiated by and follow up treatments have been conducted annually by MCOSD staff. Continue to work with neighbors to control broom on adjacent properties (source population for preserve) b) assess, map, develop project scope and treat scattered patches of Scotch broom (*C. scoparius*) and large mixed stands of Scotch and French broom.	3
	Old St. Hilary's	An ongoing volunteer-based broom control program has been conducted since 2004 resulting in containment of many large site populations. Scattered individuals and follow up patches remain and are treated regularly by both staff and volunteers. Included in the overall broom control assessment process: (1) Assess location of remaining French broom relative to serpentine grasslands and special-status plants. (2) Coordinate with adjacent landowners- possibility of cost-sharing control efforts and/or coordinating control on preserve and in adjacent areas. (3) Evaluate priorities for this species in comparison to other for funding as a part of the $18K annual endowment. (4) Work directly with Broom Busters to assess priorities and volunteer capacity.	7.5
	Pacheco Valle	An ongoing broom control program has been conducted since 2006 on 4-5 populations (approximately 10 acres total), located along fire roads and in and near a primary fuel break. The project was initiated by MCOSD because MCFD was constructing a primary fuelbreak along ridge. Follow up treatments have been conducted annually by MCOSD staff. Our goal is to reduce the density of this population to a hand pull site, but because this population is so large and dense, an integrated approach of spot application herbicide will be used for the next season and we will assess seedbank and treatment effectiveness to determine the next treatment cycle.	10
	Rush Creek	Treatment began in 2004 for this approximately 5.5 acre infestation. The project was initiated by MCOSD staff and volunteers and follow up treatments have been conducted annually by MCOSD staff and volunteers. Include the following as part of the overall broom control assessment process: (1) Reassess distribution of tree of heaven and French broom, especially along newly constructed trail and confirm priorities; (2) Analyze treatment data from 10/2011 to implement best treatment this year. ~~Potential follow-up treatment could include select stump treatment of herbicide.~~	5.5

Project Title	Preserve(s)	Description	Estimated Acres Treated

Project Title	Preserve(s)	Description	Estimated Acres Treated
Invasive Plant Control (Other Species Not Listed Above), Cont'd.	Little Mountain	An acacia removal project was initiated in 2010 by MCOSD, with follow-up treatment scheduled for 2011 by MCOSD staff. Assess the continuation of the current control efforts as a part of the larger prioritization effort outlined above. If deemed high priority, identify most effective IPM-based treatment methods and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments.	.05
	Old St. Hilary's	An ongoing pride of Madeira control program of approximately 0.4 acres has been conducted since 2009, with follow-up treatments conducted by MCOSD staff and volunteers. This species is spreading onto the preserve from adjacent properties. (1) ~~Hand~~ Use the most effective IPM-based treatment method to remove any above ground plants. (2) Monitor (through EDRR and Rapid Assessment) the efficacy of treatment. (3) Coordinate with adjacent landowners of the possibility of cost-sharing control efforts and/or coordinating control on preserve and in adjacent areas. Additionally, a 0.9 acre population of Acacia was mapped by MCOSD and initial treatments of pioneer trees were conducted by MCOSD staff in 2011. (4) Develop a long-term project plan based on overall invasive priorities and adjacency to sensitive habitat to control and eventually eradicate this species from the preserve. Note: Thoroughwort is addressed in project # 11 above.	0.4
	Ring Mountain	Since 2002 numerous invasive weed control programs have been initiated on the Ring Mountain Preserve. Both MCP staff and volunteers have been working to remove high priority weeds such as tocalote (0.75 acres), tall fescue (0.2 acres), fennel (3 acres), and pampas grass (4 acres) using an ~~integrative pest management (IPM)~~ approach. MCOSD staffs are now planning on expanding many of these project footprints in order to protect high value habitat. (1) Develop a control effort for Chilean mayten (12 acres), another high priority weeds, and seek partnership of other organizations such as BAEDN and CalFlora. (2) Continue mapping and monitoring efforts with the goal of detecting new threats, and assessing the efficacy of control techniques. The most effective IPM-based treatment methods will be adopted for the remaining high priority sites in order to ensure success.	19.95
	Rush Creek	An ongoing tree of heaven (A. altissima) control project consisting of approximately 0.3 acres has been conducted since 2005, with follow up treatments undertaken by MCOSD staff and volunteers. Assess the continuation of the current control efforts as a part of the larger prioritization effort outlined above. If deemed high priority, reassess distribution of tree of heaven and French broom, especially along newly constructed trail and identify most effective IPM-based treatment methods and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments.	0.3
	Terra Linda/Sleepy Hollow	Control of two dense patches (totaling approximately 2 acres) of Oblong spurge behind homes was initiated by hired contracted crews in 2010. MCOSD followed up with hand removal in 2011. (1) ~~Continue hand removal of all above ground plants~~ Continue treating area using an IPM-based approach, monitor, and follow up removal if needed. (2) A dense population (approximately 0.15 acres) of pennyroyal surrounding a vernal pool along preserve boundary has been treated annually by MCOSD since 2007. MCOSD staff and volunteers will continue follow up ~~hand removal~~ treatment until population is eradicated. (3) Treatment ~~(hand removal)~~ of approximately 0.25 acres of Himalayan blackberry (*R. armeniacus*) was initiated in 2007 from seeps above Wintergreen Terrace by MCOSD volunteers. MCOSD will monitor and hand remove any remixing re-sprouting plants at this site. Continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments. (4) Several patches of medusa head, (totaling approximately 0.3 acres) have been observed along border of preserve, near a DPW street maintenance transfer/storage area along Miller Creek. Reassess this population and identify if it is a priority site. If so, determine most effective IPM-based treatment methods and (through EDRR and Rapid Assessment) efficacy of treatments. (5) Treatment for a pampas grass population (totaling approx. 1 acre) was initiated in 2000. This site has been successfully reduced to a hand pull site of scattered re-sprouting plants. Continue to hand pull all above ground plants and monitor (through EDRR and Rapid Assessment) efficacy of treatment.	3.7
District-Wide Wide-Area Fuel Break Assessment - Existing And Future	All preserves with existing and proposed wide-area fuel breaks	(1) Review and assess current and FMP-proposed fuel break locations with recommendations within Chapter 4. (2) Determine priorities for continued and new treatments - to include an assessment of all existing fuelbreaks and invasive plant occurrences and determine which breaks need broom containment zones, and which fuel breaks should be converted to wide-area fuel breaks to minimize potential spread of broom. (3) Identify target invasive species within all proposed wide-area breaks and assess where fuelbreak boundaries should be located to prevent continued spread of target invasive species. (4) Identify resources and treatment techniques required to initiate and sustain wide-are fuel breaks. (5) Develop monitoring cycle and long-term treatment cycle for each priority break based upon desired conditions. (6) In coordination with MCFD and other fire agencies provide recommendation about which locations are priorities for MCOSD for continued treatment, and what resources are required to sustain breaks. (7) Prepare agreements with fire agencies for prioritizing, resourcing, maintaining and monitoring work.	-
Wide Area Fuel Break Vegetation Management - (Worn Springs Fire Road)	Bald Hill	A 30-acre wide-area primary fuel break was initially cut in 2009. (1) Review and assess this break location with recommendations within Chapter 4. (2) Determine priorities for continued and new treatments, and assess invasive plant occurrences and determine if this break should be converted to a wide-area fuel break to minimize potential spread of broom.	30
Wide Area Fuel Break Vegetation Management - Crown To Coronet	Baltimore Canyon - Crown Fire Road	A 4.3 acre wide-area fuel break was established in 2010 by MCFD, MCOSD, Kentfield Fire Dept., and PG&E. Initial actions included the mechanical treatment of all invasive plants (French broom, acacia, etc.). (1) Follow up treatment in 2012 will include ~~spot~~ treating re-sprouting broom ~~with herbicide~~. (2) Reassess distribution and control treatments of target invasive plants within fuel break, and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments. (3) Meet with county fire to discuss opportunities to conduct dual fuel reduction/invasive plant control projects for broom/acacia in area as well as sustain fuel break.	4.3
Wide Area Fuel Break Vegetation Management Hillside	Blithesdale Summit (Summit-Hillside)	A 14.2-acre wide-area fuel break was established in 2010 by MCOSD and MVFD and is maintained by both agencies. Initial actions included the mechanical treatment of 14 acres of French broom and other species (Cotoneaster, pampas grass, pride of Madeira, etc.). (1) Follow up treatment in 2012 will include ~~spot~~ treating re-sprouting broom ~~with herbicide~~. (2) Reassess distribution and control treatments of target invasive plants within fuel break, and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments.	14.2
Wide Area Fuel Break Vegetation Management - Camino Alto	Camino Alto Fire Rd.- Camino Alto Avenue	A 15-acre wide-area fuel break was established in 2010 by MCOSD and MVFD and is maintained by MCOSD and MVFD. Initial actions included the mechanical treatment of 15 acres of French broom and pampas grass. Assess the continuation of the current fuels management efforts as a part of the larger prioritization effort outlined above. If deemed high priority, reassess distribution and control treatments of target invasive plants (e.g. French broom, etc.) within fuel break, and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments. Meet with county fire to discuss opportunities to conduct dual fuel reduction/invasive plant control projects for broom/eucalyptus in area as well as sustain fuel break.	15
Wide Area Fuel Break Vegetation Management - Camino Alto Ii	Del Casa Fire Road	A 15-acre wide-area fuel break was established in 2011 by MCOSD and MVFD and is maintained by both agencies. Initial actions included the mechanical treatment of 15 acres of French broom and pampas grass. (1) Follow up treatment in 2012 will include ~~spot~~ treating re-sprouting broom ~~with herbicide~~. (2) Reassess distribution and control treatments of target invasive plants within fuel break, and continue to implement and monitor (through EDRR and Rapid Assessment) efficacy of treatments.	15
District-Wide Flashy Fuels Management	All - with focus on Zone 4: Urban Interface Vegetation Management Zone	(1) Assess current flashy fuels control program. (2) Determine priorities for continued and new treatments based on property lines, revised definition of fire threats (in coordination with MCFD). (3) Identify special status species and target invasive plants within proposed flashy fuel treatments and change treatment timing so as to not impact special status species, including nesting birds, and to not spread invasives, and to increase invasive treatment effectiveness. (4) Develop a rotating mowing and monitoring schedule based on bird nesting and invasive treatment calendars. (5) Prepare agreements with fire agencies for prioritizing, resourcing, maintaining and monitoring flashy fuels clearing.	-
District-Wide – Special-Status And Locally Rare Plants Inventory	All preserves that were not completed as a part of 2009 protocol-based surveys. Complete in order of priority set in Chapter 5	(1) Identify all preserves where special-status and locally rare species mapping has not completed using protocol-based survey methods. (2) Using priorities set in Chapter 5, complete inventory and mapping of special- status and locally rare plants. (3) Update GIS database.	-
District-Wide Vegetation Management Of Road And Trail	All	(1) In coordination with Roads and Trails Management Planning effort, and using condition assessment and vegetation data collected as a part of the roads and trails planning effort, access requirement needs for projects 15-23, and District-wide plans for visitor access, review and evaluate which roads and trails require vegetation management for maintaining access. (2) Identify target invasive species	-

Project Title	Preserve(s)	Description	Estimated Acres Treated
Corridors For Access		within all proposed road and trail corridors and assess where vegetation management should be located to prevent continued spread of target invasive species.(3) Determine the frequency (e.g. annual, biannual etc.), optimal timing (e.g. late winter, etc.), and type of treatment (e.g. mechanical brushing, hand pruning, etc.) for treating priority roads and trails corridors. (4) In coordination with MCFD and other fire and land management agencies provide recommendation about which roads and trails corridors are priorities for MCOSD for continued treatment.	
District-Wide Removal Of Priority Redundant, Under-Used/ Un-Necessary And/Or High Maintenance Roads And Trails, Related Restoration Of Native Vegetation Types	All	(1) In coordination with the current road and trail planning effort, MCOSD staff, MCFD, and other local fire agencies will jointly evaluate the conditions assessment for existing roads and trails and determine any redundant, unnecessary, underused, and high-maintenance roads and trails (special consideration given to roads and trails located within sensitive vegetation types and special status species habitats (e.g., Legacy and Restoration zones). (2) Assess, determine and prioritize which roads and trails should be realigned, downsized (in part or entirety), or removed in order to protect sensitive biological resources and help reduce overall vegetation maintenance costs. (3) Prepare obliteration/habitat restoration strategy for each road/trail system prioritized. (4) Develop signage, public engagement materials and monitor closure.	-
Assistance With Implementing Recovery Plans For Federally-Listed Plant Populations		Contact USFWS to discuss how best to implement Recovery Plans for federally endangered species on MCOSD lands (e.g., Ring Mountain, Bothin Marsh). Coordinate funding, protection and enhancement actions, and implementation responsibilities with USFWS, DFW, and other agencies who oversee recovery plan implementation.	-
Rotational Grazing & Habitat Enhancement Program	Horse Hill (Mesa Area) Mount Burdell	(1) Per recommendations of the Alto Bowl/Horse Hill Resource Survey (2009), Grazing Recommendations for Mt. Burdell (2008) and the Mt. Burdell Management Plan (1990), review current best practices for managing livestock in sensitive open space areas. (2) Implement management strategy - consider rotational grazing, fencing to ensure livestock impacts are reduced such that actions support habitat restoration objectives (e.g. reduce invasive plant infestations, promote oak seedling recruitment and establishment, protect sensitive resources, etc.). (3) Revise grazing leases to reflect revised grazing management plan. (4) Develop and implement a maintenance and monitoring program for grazed areas. (4) Monitor results and adaptively manage.	1,724
Complete And Validate Wetland, Riparian Woodland And Grassland Classifications	All preserves that support these vegetation classifications.	(1) Grassland and riparian vegetation data in the current vegetation GIS dataset is incomplete. Conduct a targeted inventory of riparian woodland and grassland vegetation types (especially those that could support special status species) using protocols consistent with existing vegetation classification data. (2) Update GIS database.	-
Riparian And Stream-Side Habitat Restoration	Cascade Canyon Roy's Redwoods	(1) Per recommendations in the Cascade Canyon & White Hill Land Management Plan (2005) and the Land Management Plan for Roy's Redwoods and Maurice Thorner Memorial Open Space Preserves (1989), assess riparian area condition and associated natural resource values, to include identifying threats and impacts (invasive plant infestations, erosion, non-designated access/use; infrastructure, etc.) to riparian and woodland corridors. (2) prioritize actions and develop a strategy to implement, including creating more shaded aquatic stream habitat and improve habitat function by removing nonnative trees and interplanting native trees over creek channels. (3) Design and implement monitoring and maintenance strategies for this developed plan.	-
Alto Bowl Oak Seedling Protection	Horse Hill	(1) Install oak protection (grazing) around oak seedlings (especially around NE edge of oak woodland). (2) Monitor seedling development and protection efficacy, removing or replacing protection as goals are achieved.	<1
Kent Island Restoration Plan	Bolinas Lagoon (Kent Island)	(1) Per recommendations of the Kent Island Restoration at Bolinas Lagoon (2009) report, remove targeted invasive plants from Kent Island. (2) Implement MOU with Audubon to remove identified understory vegetation in a manner not to impact rookeries. (3) Implement monitoring program and develop maintenance plan.	23
Bothin Marsh Special-Status Plant And Wildlife Habitat Restoration Project	Bothin Marsh	See #13 District-Wide Target Priority Invasive Plant Control (Other Species) above. Follow recommendation in Bothin Marsh Enhancement Plan 2004: (1) Conduct annual invasive plant surveys of known salt marsh birds-beak and clapper rail habitats and targeted removal invasive plants. (2) Conduct EDRR for entire marsh initially targeting iceplant, fennel, acacia species and Russian thistle (note that Spartina and perennial pepperweed control are addressed in projects 7 & 9). (3) Monitor bird's beak population annually. (4) Continue enhancement of upland cover along outer levy and paths (initiated by volunteer program under a Conservancy grant). 5) Monitor and adaptively manage.	94.5
Bothin Marsh South Basin Excavation Project	Bothin Marsh	(1) Consider partnering with DPW to excavate 0.5 acres of fill at west end of South Basin (potential mitigation for DPW's Coyote Creek dredging project). (2) Develop a joint dredging and restoration plan with DPW. (3) Complete necessary permitting and environmental review. (4) Implement restoration and dredging actions. (5) Develop and implement mitigation and monitoring program.	0.5
Cascade Canyon Grassland Type Conversion & Meadow Restoration - Pilot Project	Cascade Canyon	(1) ~~Based on Cascade Canyon Management Plan (2005),~~ Assess and select one invaded/disturbed meadow area to convert to native grassland habitat. (2) Identify targeted threats and control/removal treatments to achieve restoration/conversion objectives (e.g. conduct Douglas fir sapling removal, control priority invasive plants, etc.). (3) Implement maintenance and monitoring program until eradication and/or control is achieved.	-

Identify and Address Regulatory Requirements (VBMP p. 5-22)

Environmental regulations that may influence projects:

- Federal Endangered Species Act
- Federal Migratory Bird Treaty Act
- Clean Water Act, sections 401, 402, and 404
- Porter-Cologne Water Quality Control Act
- Rivers and Harbors Act, section 10
- Executive Order 11990 – Protection of Wetlands
- Executive Order 13112 – Invasive Species
- California Fish and Game Code, section 1602 (Streambed Alteration Agreement)
- California Fish and Game Code - Fully Protected Species
- California Fish and Game Code, sections 3503 and 3503.5 – Protection of Birds and Bird Nests and Raptors and Raptor Nests
- California State Wetlands Conservation Policy
- California Native Plant Protection Act (California Fish and Game Code, sections 1900 to 1913)
- California Coastal Act
- The McAteer-Petris Act
- Marin County General Plan (2007)
- Marin County Local Coastal Program Unit 1 & 2

Identify and Address Regulatory Requirements (VBMP p. 5-23)

Rivers or streams, including riparian areas, up to the edge of the 100-year floodplain may also be under the jurisdiction of the California Department of Fish and Wildlife, and projects may require a section ~~1603~~ 1602 streambed alteration agreement with the Department of Fish and Wildlife and/or the Regional Water Quality Control Board. The execution of these agreements ~~may~~ will also require compliance with the California Environmental Quality Act.

CHAPTER 7: BEST MANAGEMENT PRACTICES

BMP – General – 2 (VBMP p. 7-3)

- ***Establish a buffer of 100 feet from*** ~~wetland and tidally influenced areas~~ lakes, ponds, streams, wetlands, tidal areas, and other wet areas (i.e., from the ordinary high water mark of flowing or standing water in creeks, streams, or ponds). Avoid construction work within this buffer area.

- ~~Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP)~~ an erosion and sediment control plan ~~to protect water quality for vegetation work in or near wetlands, ponds, seeps, creeks, tidal areas, or stream crossings.~~

BMP – General – 7 (VBMP p. 7-6)

- ***Work in and near wetlands**.* Establish a buffer of 100 feet from wetland, lakes, ponds, streams, ~~and~~ tidally influenced areas, and other wet areas (i.e., from the ordinary high water mark of flowing or standing water in creeks, streams, or ponds). Avoid construction work within this buffer area.

…

» Require the contractor to prepare and implement a ~~Stormwater Pollution Prevention Plan (SWPPP)~~Erosion and sediment control plan to protect water quality for vegetation work or near wetlands, ponds, seeps, creeks, tidal areas, or stream crossings.

- ***Work in and near invasive plant infestations**.* The contractor will work with the MCOSD natural resource staff to identify any priority invasive plants that occur near the project work area, including the project footprint, access roads, staging areas, and similar work areas. The contractor agrees to comply with requirements to reduce the spread or transport of priority invasive plants related to construction activities. Requirements may include some or all of the following:

BMP – Special – Status Wildlife Species – 2 (VBMP p. 7-12)

Northern spotted owls have potential to occur on MCOSD preserves. The MCOSD will undertake the following actions when construction-related vegetation management is planned to occur within or adjacent to potential northern spotted owl habitat:

- ~~To the greatest extent possible,~~ Completely ~~avoid occupied habitat completely during key northern spotted owl breeding and nesting season (March-September~~ February – July), if any nestlings present, but under no circumstances less than a 1/4 mile from an occupied nest, unless an emergency situation requires immediate action.

~~• Avoid cutting native trees greater than 10 inches diameter at breast height within~~ occupied ~~northern spotted owl habitat within occupied habitat areas.~~

BMP – Special – Status Wildlife Species – 4 (VBMP p. 7-15)

Avoid and Protect Ridgway's Rail ~~California Clapper Rail~~, California Black Rail, and Salt Marsh Harvest Mouse

~~• Identify potential habitat for~~ Ridgway's ~~California clapper rail, California black rail, and salt marsh harvest mouse and survey to determine if it is occupied before initiating vegetation management actions. Surveys will include the proposed vegetation management footprint and 150-foot buffer area. Surveys will be conducted within 14 days of the start of active ground disturbing activities.~~

- **To the greatest extent possible, avoid occupied habitat completely during key breeding and nesting periods.** Activities in or near known California clapper or black rail sites will be avoided during the nesting season (~~March~~ February 1-~~August 31~~ August 1).

BMP – Special-Status Wildlife-5, Literature Reviews

Prior to all vegetation management activities, literature reviews will be conducted to determine if special-status wildlife-species or critical habitats exist within the project area.

The first source reviewed will be the MCOSD's database of special-status wildlife occurrences and sensitive habitats. This database is actively updated and maintained by the MCOSD natural resource staff and contains the most relevant data on sensitive resources on MCOSD land.

In addition to the MCOSD database, the following resources will be reviewed, as necessary, prior to work:

- U.S. Geological Survey topographic maps
- Aerial photographs
- California Department of Fish and Wildlife Natural Diversity Database records
- U.S. Fish and Wildlife Service quadrangle species lists
- University of California at Davis Information Center for the Environment Distribution Maps for Fishes in California
- National Marine Fisheries Service Distribution Maps for California Salmonid Species

Database searches for known occurrences of special-status wildlife species will focus on the vicinity of the project area. Biological communities will be classified as sensitive or non-sensitive as defined by the California Environmental Quality Act and other applicable laws and regulations.

Special-Status Wildlife-6, Preconstruction Surveys

If it is determined that special-status wildlife species may occur in a project area, a qualified biologist will survey the area during the appropriate time window to determine the presence or absence of the species. If the species is located, the MCOSD should conduct the activity to avoid impacts to the species. If avoidance is not possible, the appropriate resource agencies will be contacted to obtain guidance or the necessary permits.

BMP – Special – Status Plants – 1 (VBMP p. 7-16)

The MCOSD will undertake the following actions when construction-related vegetation management is planned to occur within or adjacent to special-status plant populations:

- ~~Identify potential special-status plant habitat and survey to determine if it is occupied before initiating vegetation management actions. Surveys will include the proposed vegetation management footprint and 100-foot buffer area. Surveys will be conducted~~ when the plants are in bloom or can otherwise be identified. ~~within 14 days of the start of active ground disturbing activities.~~

Special-Status Plants-6, Literature Reviews

Prior to all management activities, literature reviews will be conducted to determine if special-status plant species, critical habitats, or sensitive communities exist within the project area. In addition to the MCOSD database, the following resources will be reviewed, as necessary, prior to work:

- U.S. Geological Survey topographic maps
- U.S. Fish and Wildlife Service National Wetlands Inventory maps
- Bay Area Aquatic Resource Inventory Database
- Aerial photographs
- California Department of Fish and Wildlife Natural Diversity Database records
- U.S. Fish and Wildlife Service quadrangle species lists
- California Native Plant Society inventory records

Database searches for known occurrences of special-status plant species will focus on the vicinity of the project area. Biological communities present in the project location and surrounding areas will be classified based on existing plant community descriptions described in the Preliminary Descriptions of the Terrestrial Natural Communities of California (Holland 1986). Biological communities will be classified as sensitive or non-sensitive as defined by the California Environmental Quality Act and other applicable laws and regulations.

APPENDIX A: CURRENT MANAGEMENT PLANS AND PRACTICES

Table A.1 Preserve-Specific Management Plans and Reports (VBMP p. A-3)

Kent Island Restoration Plan at Bolinas Lagoon (2009)	*The Kent Island Restoration Plan at Bolinas Lagoon* guides restoration of tidal wetlands at Kent Island. ~~The plan Includes 13 recommendations from the Bolinas Lagoon Ecosystem Restoration Project (see below).~~
San Geronimo Valley Salmon Enhancement Plan (2009)	The plan provides enhancement recommendations for salmonid habitats and associated riparian corridors in San Geronimo Valley to achieve the following goals: (1) preserve and improve habitat conditions for salmonids, (2) promote ecosystem resiliency through rehabilitating natural processes, (3) correct and avoid activities that degrade habitat, and (4) sustain character and quality of life in San Geronimo Valley.
Fuelbreak Vegetation Assessment– Marin County Open Space District (2008)	The *Fuelbreak Vegetation Assessment* assesses native vegetation diversity and maps invasive plants in existing and proposed fuelbreak areas in 15 MCOSD preserves. It recommends perpetual maintenance of all current fuel management areas and fire roads to help curb the spread of invasive plants throughout the preserves, and the maintenance of specific areas for fire risk reduction, using alternative strategies (e.g. controlled burns) to meet fuel reduction goals. The assessment also recommends the potential realignment of some fuelbreaks from the interiors of the preserves to the perimeters of the preserves, and/or to already disturbed areas, to help maintain large intact areas of undisturbed native habitats. Maintenance guidelines are included for fuel management actions implemented within the interiors of the preserves, along with recommendations and planning-level cost estimates intended to assist MCOSD with prioritizing invasive species control efforts.
~~Draft~~ Bolinas Lagoon Ecosystem Restoration Project Recommendations for Restoration and Management (2008)	This document contains very little on vegetation management. It focuses on restoration of natural sediment transport and natural processes and ecological function, protection of water quality, and the amelioration of human-induced negative effects. It contains 13 recommendations for the restoration and management of Bolinas Lagoon including treatment of invasive spartina~~, which are also included in the Kent Island restoration plan (see above)~~.
Ring Mountain Preserve Sensitive Resources Monitoring and Enhancement Strategy (2008)	The document provides baseline information about sensitive species locations on Ring Mountain and an assessment of impacts and remedial measures for managing sensitive vegetation, but it does not include comprehensive vegetation management recommendations for the preserve. It includes a list of targeted invasive plants and a list of priority invasive plant management projects in and near special status species occurrences.
Grazing Recommendations for Mount Burdell Open Space Preserve (2008)	In addition to providing grazing recommendations, this document identifies vegetation management goals and objectives for the Mount Burdell preserve, summarizes existing site and grassland conditions, identifies and maps sensitive resources, identifies threats and impacts to resources (specifically, targeted invasive plants), and describes the current grazing regime and infrastructure.

Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan (2005)	The draft *Land Management Plan* for the Cascade Canyon and White Hill preserves establishes goals and operating policies; describes site conditions, including resource summaries and maps; describes fuel reduction strategies and fuelbreak placement; and recommends management actions for the two preserves. Goals include (1) preserving and enhancing the native plant and animal communities, geologic, hydrologic, and historic resources and scenic values of the preserves; (2) maintaining and enhancing opportunities for public recreation, education, and aesthetic enjoyment of preserves; (3) reducing the threat of wildfire to the surrounding community; and (4) minimizing and reducing the impacts of preserve use on the surrounding community. The plan attempts to reconcile the effects of varying management actions on the preserves' biodiversity by making recommendations about how to control invasive plant establishment in fuelbreaks, the timing and sequencing of maintenance activities, the priorities for monitoring, and the best management practices for trails and fire roads.
Santa Venetia Marsh Enhancement Plan - Existing Condition Study and Enhancement Recommendations (2002)	The *Santa Venetia Marsh Enhancement Plan* assesses existing conditions, identifies invasive plant control actions, and identifies three categories of enhancement measures to improve habitat values and benefits: (1) Upland Buffer Zone enhancement planting, (2) buffer and marsh plain protection measures, and (3) channel modification.
Interim Management Guidelines for the Horse Hill Area Alto Bowl/ Horse Hill Open Space Preserve (1998)	Developed as an interim document to guide decision making until a more comprehensive management plan is prepared, this guideline focuses on achieving a balance of protecting resources while meeting equestrian needs. Recommendations for vegetation management include the fencing and monitoring of sensitive resources and the control of targeted invasive plants (e.g., broom, pampas grass, yellow and purple star thistles).
Bolinas Lagoon Management Plan Update (1996)	~~This plan has been superseded by the 2008 *Draft Bolinas Lagoon Ecosystem Restoration Project Recommendations for Restoration and Management* (see above).~~ This plan provides direction for the management of Bolinas Lagoon, including treatment of invasive plants.
Mount Tamalpais Area Vegetation Management Plan (1995)	The *Mt. Tamalpais Area Vegetation Plan* contracted by MMWD and MCOSD covers more than 19,000 acres of MMWD lands and an adjacent 1,150 acres of MCOSD preserve lands. The chief goals of the plan are fire- hazard reduction and maintaining the watershed's biological diversity.

Table B.3 Special-Status and Other Species of Special Concern that are known to or could exist Could Exist on Preserves

Scientific Name	Common Name	Federal	State	Other	Habitat Association
Plants					
…					
Amorpha californica var. napensis	Napa false indigo bush			CNPS 1B.2	Forest/chaparral/woodland
…					
Castilleja ambigua var. humboldtiensis	Humboldt bay owl's clover			CNPS 1B.2	Salt Marsh
…					
Entostodon Entosthodon kochii	Koch's cord moss	-	-	CNPS 1B	Unknown
…					
~~*Leptosiphon acicularis*~~	~~Bristly linanthus~~			~~CNPS 4~~	
…					
Fritillaria liliacea	fFragrant fritillary	-	-	CNPS 1B	Coastal scrub/prairie/grassland
…					
Pentachaeta bellidiflora	White rayed pentachaeta			1B.1	Valley Grassland: Affinity for serpentine
…					
Stebbinsoseris decipiens	Santa Cruz microseris			CNPS 1B.2	Coastal prairie/chaparral/mixed evergreen forest, Closed-cone Pine Forest, Northern Coastal Scrub
…					
~~*Thermopsis macrophylla*~~	~~Common false lupine~~	~~-~~	~~-~~	~~CNPS 1B~~	~~Mixed evergreen forest, foothill woodland/valley~~
…					
Amphibian					
Rana boylii	Foothill yellow-legged frog	-	Special concern	-	Streams with rocky substrate
Rana draytonii	California red-legged frog	Threatened	Special concern	-	Forests/woodlands/grasslands and streamsides
Dicamptodon ensatus	California giant salamander	-	Special concern	-	Lakes, ponds, rivers, and streams. Prefers fast moving water to slow moving water
…					
Fish					

Scientific Name	Common Name	Federal	State	Other	Habitat Association
Eucyclogobius newberryi	Tidewater goby	Endangered	Special concern	-	Brackish water, marsh/bays
<u>*Lavinia symmetricus ssp. Symmetricus*</u>	Tomales roach	-	Special concern	-	Tributaries of Tomales Bay
Oncorhynchus kisutch	Coho salmon	Endangered	Threatened / endangered	-	Spawns in freshwater streams
Oncorhynchus tshawytscha	Chinook salmon	Threatened	Threatened	-	Spawns in freshwater streams
Oncorhynchus mykiss irideus	Steelhead trout	Threatened	Special concern	-	Spawns in freshwater streams
Pogonichtys macrolepidotus	Sacramento splittail	-	-	-	Brackish water, marsh/bays
<u>Invertebrates</u>					
<u>*Adela oplerella*</u>	<u>Opler's longhorn moth</u>			<u>G2 S2</u>	<u>Associated with serpentine plant species</u>
Caecidotea tomalensis	Tomales isopod	-	-	-	Freshwater marsh/ponds
Calicina diminua	Marin blind harvestman	-	-	-	No information
Callophrys mossii marinensis	Marin elfin butterfly	-	-	-	Serpentine
Danaus plexippus	Monarch butterfly (nesting colonies/ larval foodplant)	-	-	Locally rare	Overwinters in blue gum eucalyptus/Monterey cypress. Feeds on *Asclepias fascicularis*
Haliotis cracherodii	Black abalone	Candidate	-	-	Rocky intertidal zone and ocean waters
Haliotis sorenseni	White abalone	Endangered	-	-	Rocky intertidal zone and ocean waters
Plebejus icarioides missionensis	Mission blue butterfly	Endangered	-	-	Shrubs/grasslands with lupine host
~~*Lavinia symmetricus ssp. Symmetricus*~~	~~Tomales roach~~	-	~~Special concern~~	-	~~Tributaries of Tomales Bay~~
…					
Mammals					
…					
Scapanus latimanus insularis	Angel Island mole	-	Special concern	-	Coastal scrub/prairie on Angel Island
…					
Other Locally Rare Species of Interest					
…					
<u>*Aspidotis californica*</u>	<u>California lace fern</u>			<u>Locally Rare</u>	<u>Yellow Pine Forest, Foothill Woodland, Chaparral, Valley Grassland</u>

Scientific Name	Common Name	Federal	State	Other	Habitat Association
…					
Aspidotis carlotta-halliae	Carlotta hall's lace fern			CNPS 4.2	Affinity to serpentine soil
…					
Leptosiphon acicularis	Bristly linanthus			CNPS 4	Coastal Prairie, Chaparral, Foothill Woodland
…					
Monardella purpurea	Coyote mint			Locally rare	Serpentine

APPENDIX B: NATIVE VEGETATION ON PRESERVES

Table B.4 Special-Status *Plant* Species Known to Exist on Preserves (VBMP p. B-27; the rows that are shaded in grey are where changes have been made)

Scientific Name	Common Name	Number of preserves with species	Alto Bowl	Bald Hill	Baltimore Canyon	Blithedale Summit	Bolinas Lagoon	Bothin Marsh	Camino Alto	Cascade Canyon	Deer Island	French Ranch	Gary Giacomini	Horse Hill	Ignacio Valley	Indian Tree	Indian Valley	King Mountain	Little Mountain	Loma Alta	Loma Verde	Lucas valley	Maurice Thorner Memorial Open Space	Mt Burdell	Mt Tamalpais	Old St Hillary's	Pacheco Valley	Ring Mtn	Roy's Redwoods	Rush Creek	San Pedro Ridge	San Rafael Ridge	Santa Venetia Marsh	Santa Margarita Island	Terra Linda/Sleepy Hollow	Tiburon Ridge	Verissimo Hills	White Hill
Allium lacunosum	pitted onion	1																										■										
Amorpha californica var. napensis	indigo bush	2			■					■																												
Amsinckia lunaris	bent-flowered fiddleneck	1																		■																		
Arctostaphylos montana ssp. montana	Mt. Tamalpais manzanita	2										■	■																									
Arctostaphylos virgata	Marin manzanita	1											■																									
Asclepias fascicularis	narrow leaf milkweed	1																						■														
Aspidotis californica	California lace fern	1										■																										
Aspidotis carlotta-halliae	Carlotta hall's lace fern	1																								■												
Astragalus pycnostachyus var. pycnostachyus	marsh milk vetch	1					■																															
Calamagrostis ophitidis	serpentine reed grass	~~3~~ 4										■	■													■		■										
Calandrinia breweri	Brewer's redmaids	1			■																																	
Calochortus umbellatus	Oakland star-tulip	3											■							■								■										
Calochortus tiburonensis	Tiburon mariposa lily																											■										
Castilleja affinis ssp. neglecta	Tiburon indian paintbrush	2																								■		■										
Castilleja ambigua ssp. humboldtiensis	Humboldt Bay owl's clover	1					■																															
Ceanothus velutinus	tobacco brush	1											■																									
Cirsium hydrophilum var. vaseyi	Mt. Tamalpais thistle	1											■																									
Chloropyron maritimum ssp. palustre	Point Reyes bird's beak	2					■	■																														
Elymus californicus	California bottle brush grass	1											■																									
Erigeron biolettii	streamside daisy	1																						■														
Erigeron foliosus var. franciscensis	San Francisco leafy fleabane	1																								■												
Eriogonum luteolum var. caninum	Tiburon buckwheat	5			■							■												■		■		■										
Fremontodendron californicum	California fremontia	1											■																									
Fritillaria liliacea	fragrant fritillary	2																						■														
Hesperolinon congestum	Marin western flax	5											■							■				■		■		■										
Kopsiopsis hookeri	coast ground cone	1			■																																	
Leptosiphon acicularis	bristly leptosiphon	7											■			■	■					■		■					■									

Scientific Name	Common Name	Number of preserves with species	Alto Bowl	Bald Hill	Baltimore Canyon	Blithedale Summit	Bolinas Lagoon	Bothin Marsh	Camino Alto	Cascade Canyon	Deer Island	French Ranch	Gary Giacomini	Horse Hill	Ignacio Valley	Indian Tree	Indian Valley	King Mountain	Little Mountain	Loma Alta	Loma Verde	Lucas valley	Maurice Thorner Memorial Open Space	Mt Burdell	Mt Tamalpais	Old St Hillary's	Pacheco Valley	Ring Mtn	Roy's Redwoods	Rush Creek	San Pedro Ridge	San Rafael Ridge	Santa Venetia Marsh	Santa Margarita Island	Terra Linda/Sleepy Hollow	Tiburon Ridge	Verissimo Hills	White Hill
Lessingia hololeuca	wooly headed lessingia	4																					■					■						■			
Lessingia micradenia var. micradenia	Mt. Tamalpais lessingia	2										■	■																								
Lilium pardalinum	leopard lily	1																								■											
Monolopia major	cupped monolopia	1																					■														
Navarretia cotulifolia	featherleaf navarretia	1																					■														
Navarretia heterodoxa	Calistoga navarettia	1								■																											
Navarretia leucocephala ssp. bakeri	Baker's navarretia	1																					■														
Navarretia rosulata	Marin County navarettia	1											■																								
Parnassia californica palustris	California grass of Parnassus	1																								■											
Pentachaeta bellidiflora	whiteray pygmydaisy	1																■																			
Pleuropogon hooverianus	North coast semaphore grass	1																									■										
Ranunculus lobbii	Lobb's buttercup	2																					■											■			
Rhododendron macrophyllum	coast rhodendron	1				■																															
Stebbinsoseris decipiens	~~Santa Cruz microseris~~	~~1~~											■																								
Streptanthus batrachopus	Tamalpais jewelflower									■			■																								
Streptanthus glandulosus ssp. pulchellus	Mt. Tamalpais jewelflower	2								■			■																								■
Streptanthus glandulosus ssp. secundus	one sided jewelflower	1																																■			
Streptanthus glandulosus	bristly jewelflower	1																																			
Streptanthus glandulosus ssp. niger	Tiburon jewelflower	1																								■											
Thermopsis macrophylla	~~common false lupine~~	~~1~~																										■									
Toxicoscordion fontanum	marsh zigadenus	4										■	■													■		■									
Trifolium dichotomum	branched Indian clover	1																																			■
Trifolium amoenum	~~showy Indian clover~~	~~1~~																										■									
Trifolium buckwestiorum	~~Santa Cruz clover~~	~~1~~																										■									
Triteleia peduncularis	long-rayed brodiaea	1																										■									

Appendix C: Nonnative Vegetation on Preserves

Table C.1 Nonnative Plant Species Known to Exist on Preserves ***(VBMP pp. C-3 – C-19)***

		No. of Preserves	Alto Bowl	Bald Hill	Baltimore Canyon	Blithedale Summit	Bolinas Lagoon	Bothin Marsh	Camino Alto	Cascade Canyon	Deer Island	French Ranch	Gary Giacomini	Horse Hill	Ignacio Valley	Indian Tree	Indian Valley	King Mountain	Little Mountain	Loma Alta	Loma Verde	Lucas Valley	Maurice Thorner	Mt Burdell	Old St Hilary's	Pacheco Valle	Ring Mountain	Roy's Redwoods	Rush Creek	San Pedro Mountain	Santa Margarita Island	Santa Venita Marsh	Terra Linda/Sleepy Hollow	Tiburon Ridge	Verrissimo Hills	White Hill
…																																				
Erechtites glomerata *Senecio glomeratus (=Erechtites glomerata)*	cutleaf burnweed	~~3~~ 4			■	■																				■	■									
Erechtites minima *Senecio minimus (=Erechtites minima)*	Australian fireweed~~+b106~~	13	■		■	■	■			■		■	■		■	■	■	■									■	■								
~~*Erechtites prenanthoides*~~	~~coastal burnweed~~	~~1~~	~~■~~																																	
…																																				
Festuca perennis (=Lolium multiflorum)	Italian ryegrass	30	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■		■	■	■	■	■

APPENDIX D: DEVELOPMENT OF VEGETATION MANAGEMENT ZONES

Landbird Species Habitat Modeling (VBMP p. A-3)

This dataset was derived from model developed by the ~~Point Reyes Bird Observatory~~ Point Blue (PRBO 2010). Two modeling outputs were integrated into the development of the vegetation zones: overall native avian species diversity, and areas supporting at-risk bird species (bird species of special concern and/or declining).

9.3 PERSONS COMMENTING

WRITTEN COMMENTS

Written comments on the *Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report* were received from the following agencies, organizations, and individuals.

LOCAL, REGIONAL, AND STATE AGENCIES

1. Christine Lehnertz, General Superintendent, National Park Service, United States Department of the Interior, June 4, 2015
2. Patricia Maurice, District Branch Chief, Department of Transportation, California State Transportation Agency, June 15, 2015

ORGANIZATIONS

3. Ann Spake, Executive Committee Member, Sustainable TamAlmonte, Sharon Rushton, Chairperson, Sustainable TamAlmonte, Sustainable TamAlmonte, May 20, 2015
4. Sharon Rushton, Ann Spake, Laura Chariton, Sustainable TamAlmonte, Watershed Alliance of Marin, July 6, 2015
5. Debbie Friedman, Co-Chair & Co-Founder, MOMS Advocating Sustainability, May 21, 2015
6. Jennifer Rienks, Ph.D., President, Health Council of Marin, June 29, 2015
7. Sandra Ross, Ph.D., President and CEO, Health & Habitat, Inc., July 5, 2015
8. Sandra Ross, Ph.D., President and CEO, Health & Habitat, Inc., July 8, 2015
9. Don Grafe, Marin Association of Public Employees, July 8, 2015
10. Sandra Guldman, Friends of Corte Madera Creek Watershed, July 8, 2015
11. Barbara Salzman and Phil Peterson, Marin Audubon Society, July 8, 2015
12. Kate Powers, Marin Conservation League, July 8, 2015
13. Michael W. Graf, Community Venture Partners and Sustainable Tam/Almonte, July 8, 2015
14. Stephan C. Volker, North Coast Rivers Alliance, July 8, 2015
15. Michele Barni, Sierra Club Marin Group, July 8, 2015
16. Carolyn Longstreth, Marin Chapter, California Native Plant Society, undated

INDIVIDUALS

17. Corinne Swall, July 4, 2016
18. Kathleen Mulcahy, July 4, 2015
19. Clinton Kellner, Ph.D., July 5, 2015
20. Carol Fagan, July 5, 2015
21. Eva Buxton, July 6, 2015

22. Emily Sykes, July 8, 2015
23. Kerry Stoebner, July 8, 2015
24. Larry Rose, July 8, 2015
25. Linda Novy, July 8,, 2015
26. Mary Fraser, July 8, 2015
27. Mary Fraser, July 8, 2015 (second letter)
28. Mary Osterioh, July 8, 2015
29. Mary Osterioh, July 8, 2015 (second letter)
30. Mimi Willard, July 8, 2015
31. Sidney Dent, July 8, 2015
32. William Rothman, MD undated

PUBLIC HEARING COMMENTS

Marin County Parks and Open Space Commission Minutes - May 21, 2015

9.4 MASTER RESPONSES

INTRODUCTION TO MASTER RESPONSES

This section provides master responses that have been prepared for selected comment topics to provide a comprehensive analysis of major issues raised in multiple comments. These master responses are referred to in the response to individual comments in Section 9.4. These master responses cover the following topics:

HAZARDS - HERBICIDE USE

- Master Response 1 - Multiple Chemical Sensitivity
- Master Response 2 – Use of Glyphosate
- Master Response 3 – Alternatives to Herbicide Use
- Master Response 4 – Adjuvants and Inert Ingredients
- Master Response 5 – Herbicide Use
- Master Response 6 – Impact Evaluation

HYDROLOGY AND WATER QUALITY

- Master Response 7 – Hydrology and Water Quality

BIOLOGICAL RESOURCES

- Master Response 8 - Biodiversity Issues

- Master Response 9 - Grassland Habitat Management
- Master Response 10 - Mitigation Measure 5.1-1(a)
- Master Response 11 - Enforceability of BMPs and Decision Making Process
- Master Response 12 - Deferral of Analysis and Mitigation

MASTER RESPONSE 1 – MULTIPLE CHEMICAL SENSITIVITY

ISSUES

A number of commentors expressed concern regarding the Vegetation and Biodiversity Management Plan's potential health effects on individuals who report that they suffer adverse physical reactions due to low-level exposure to many common chemicals, commonly referred to as Multiple Chemical Sensitivity (MCS). Some commentors critiqued the Draft TPEIR for not incorporating a detailed evaluation of MCS. However, commentors fail to present any feasible recommendations outside of ceasing use of chemicals entirely.

RESPONSE

The VBMP is a comprehensive strategic plan that directs the priorities of the MCOSD's vegetation management program and does not prescribe the use of any one treatment method, including herbicides. Any description of treatment methods in the VBMP are either describing the MCOSD's current practices or those of other land management agencies. Alternative names have been used to define individuals who report suffering adverse physical reactions to low levels of many common chemicals. The primary term used in this document is MCS. Alternative names include idiopathic environmental intolerance and Toxicant-Induced Loss of Tolerance (TILT). Research into the cause(s) of MCS is ongoing and evolving, a variety of theories have been proposed to explain MCS. These theories range from hypothetical biological mechanisms to evidence indicating that MCS is a somatic symptom disorder (i.e., mental illness that causes bodily symptoms) or an idiopathic condition without a known cause rather than a chemical-caused condition. At this time, however, no strong consensus has been formed amongst the scientific community.

Prevalence of MCS

Commentors provided references discussing the prevalence of individuals who are diagnosed with MCS or otherwise consider themselves allergic or sensitive to chemicals. In reviewing this literature, a wide range of values was seen, from 0.6 percent to 36 percent of individuals surveyed reporting that they have been diagnosed with MCS or otherwise consider themselves allergic or sensitive to chemicals. This was highly dependent on the criteria used by a particular study to classify an individual as having chemical sensitivity. Many of these studies were based on phone interviews of a small sample set, and relied solely on patient responses to questions rather than any diagnostic criteria. Some definitions included getting sick after smelling chemical odors like those of perfume, pesticides, fresh paint, cigarette smoke, new carpets, or car exhaust. Odor is a sensory characteristic of chemicals, and is poorly correlated with toxicity. The design of the questions used in the interviews did not always distinguish between normal aversion to harsh chemical odors and a true hypersensitivity to common substances at low levels. [1] In the study by Caress and Steinemann they report on a sample of 1,582 individuals from Atlanta, Georgia metropolitan area. Their survey found that 12.6 percent of the individuals reported a hypersensitivity, and a 1.8 percent reported losing their jobs because of their hypersensitivity. In another study by Caress and Steinemann, they surveyed 1,054 randomly selected individuals in the United States; 11.2 percent of those individuals reported an unusual hypersensitivity to common chemical products, but only 2.5 percent reported they had been medically diagnosed with MCS. [2] In a study conducted by the California Department of Health Services, 4,046 individuals were surveyed based on 13 chemical sensitivity questions. [3] The survey found that 15.9 percent of the individuals stated they were unusually sensitive to everyday chemicals, with 8.3 percent of the respondents reporting a health impairment. The respondents who reported a doctor-diagnosed environmental illness or MCS was 6.3 percent; about half of these individuals with a diagnosis of MCS considered themselves unusually sensitivity to everyday chemicals. In addition, 0.6 percent of the respondents that had both a doctor diagnosis of MCS and a perception of unusual sensitivity to chemicals reported having a restrictive health problem, which is the closest definition of those described as MCS sufferers in medical clinic settings.

Gaps in Scientific Understanding of MCS

As detailed below, gaps in the scientific understanding of MCS make evaluation of potential risks to individuals suffering from this condition speculative. Thus, a complete impact evaluation of the risks to individuals suffering from this condition, and any related mitigation, is neither required nor presented in the TPEIR.

Although several theories for a physical mechanism have been proposed and outlines for research protocols have been published, no substantial studies have been conducted to test these theories. Several studies on the potential genetic markers have suggested some basis for genetic predisposition to lower tolerance due to polymorphisms found in specific genes associated with chemical metabolism. [4] McKeown-Eyssen et al. note that their study needs replication, and that it only suggests new research directions on genetically variable toxin pathways that might be important. Studies to specifically evaluate various immunological markers in blood, which may indicate disease, have run across problems with reproducibility of measurement levels conducted in the same lab on different days and also between laboratories. [5] In addition, studies have been conducted that show that when individuals are blindly exposed to chemicals they are certain cause harmful responses, no adverse effects are observed, and that responses occur when subjects can discern between active and placebo

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[1] Caress, S.M. and A.C. Steinemann. 2003. *A Review of a Two-Phase Population Study of Multiple Chemical Sensitivities. Environmental Health Perspectives* Volume 111 Number 12, September 2003, p 1490-1497.

[2] Caress, S.M. and A.C. Steinemann. 2004. *A National Population Study of the Prevalence of Multiple Chemical Sensitivity. Archives of Environmental Health*. June 2004. Volume 59 number 6 p. 300-305.

[3] Kreutzer. R., R.R. Neutra, N. Lashuay. 1999. *Prevalence of People Reporting Sensitivities to Chemicals in a Population-based Survey*. American Journal of Epidemiology Volume 150 Number 1. July 1, 1999. P. 1-12.

[4] McKeown-Eyssen, G., C. Baines, D.E.C. Cole, N. Riley, R.F. Tyndale, L. Marshall, V. Jazmaji. 2004. *Case-control study of genotypes in multiple chemical sensitivity: CYP2D6, NAT1, NAT2, PON1, PON2, and MTHFR*. International Journal of Epidemiology volume 33 page 971-978.

[5] Hoover, D.R., A. Donnay, C.S. Mitchell, G. Ziem, N.R. Rose, D.E. Sabath, E.J. Yurkow, R. Nakamura, R.F. Vogt, M. Waxdal, J.B. Margolick. 2003. *Reproducibility of Immunological Tests Used to Assess Multiple Chemical Sensitivity Syndrome. Clinical Diagnostic Lab Immunology* November Volume 10 number 6 pages 1029-1036.

substances. This suggests that the mechanism of action is not specific to the chemical itself, and might be related to expectations and prior beliefs.[6]

The TILT theory suggests that there is an initial exposure event that induces a person to become hypersensitive to chemicals that they previously could tolerate.[7] Pesticide exposure has been suggested as one of the several possible initial exposure events that induces the lowered tolerance, but there has been no presentation of the concentration required for this to occur, nor any physical verification that exposure did occur – which is information required to evaluate chemical risk. The studies were based on individuals self-reporting their exposure to a pesticide, with no secondary investigation or corroboration of the incidents in question. Once a loss of tolerance is induced, the studies do not indicate a level of pesticide exposure that elicits a response, a parameter which is required for a risk assessment analysis. Furthermore, once an individual is sensitive, no methods besides isolation from all chemicals have been suggested as providing a relief to symptoms.

The nitric oxide and its oxidant product peroxynitrite cycle (NO/ONOO cycle) theory suggests that exposure to various chemicals initiates a biochemical cascade cycle that involves the balance of peroxynitrite and nitric oxide.[8] The commentors did not provide any studies that specifically demonstrate that a specific pesticide exposure initiates and further exacerbates this pathway, leading to MCS. The studies presented are a theoretical hypothesis, lacking real-world studies verifying the theory. This pathway has been suggested to be involved in many diseases, but is not fully understood. It also does not specify the levels that are required to initiate the cascade, nor is it shown what levels of chemicals exacerbate this cascade cycle—all of which is required information to conduct a risk assessment.

Although a full scientific understanding does not exist of the role of chemical concentrations and exposure levels in MCS, it brings up the discussion of the evolving understanding of chemical toxicity, risk assessments, and risk management decisions. The process of human health risk assessments (HHRAs) has continually been evaluated to improve the scientific basis and communication of risk assessments. The National Academy of Sciences has periodically published reviews of the state of risk assessment, and the future direction for risk assessment to be considered by government agencies involved in human health risk-based decision making—in particular, U.S. EPA.[9][10] These seminal publications have provided the framework in which HHRAs and risk-based decisions have been conducted and evolved, in particular by the U.S. EPA. For new frameworks to be incorporated, often significant research and policy decisions are required. Recently, the National Academy of Sciences has studied the role of toxicology and the future of risk assessments, given our evolving understanding and ability to measure more sophisticated human health endpoints and intermediate biochemical processes.[11][12][13] The role

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6 Das-Munshi, J., G.J. Rubin, S. Wessely. 2006. *Multiple chemical sensitivities: A systematic review of provocation studies*. Journal of Allergy & Clinical Immunology December volume 118 Number 6 pages 1257-64.

7 Miller, C. S. 2001. *Toxicant-induced Loss of Tolerance*. Journal of Nutritional &Environmental Medicine. Volume 11 pages 181-204.

8 Pall, Martin L. 2002. *NMDA sensitization and stimulation by peroxynitrite, nitric oxide, and organic solvents as the mechanism of chemical sensitivity in multiple chemical sensitivity*. The FASEB Journal Volume 16 September p1407-1417.

9 NAP (National Academy Press). 1983. *Risk Assessment in the Federal Government: Managing the Process*.

10 NAP (National Academy Press). 1994. *Science and Judgment in Risk Assessment*.

11 NAP (National Academy Press). 2007. *Toxicity Testing in the 21st Century: A Vision and a Strategy*.

of low-level exposures in developing various human health endpoints and other more subtle effects that do not have a defined severe adverse outcome (e.g. lowered intelligence) is a topic that has not been fully addressed in current risk assessment practices and the toxicological methods used to study this effect. Although changes are suggested for the future direction, it is clearly noted that significant future research is required, along with approval by regulatory agencies, before any new approaches are determined.

As a result, no appropriate methodology exists to incorporate MCS information into a risk assessment; and adequate scientific knowledge, data, and understanding are not available to make a meaningful assessment. Any analysis of this information would be speculative, because a lack of sufficient scientific understanding exists on these issues. Section 15145 of the *State CEQA Guidelines* states that if a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact. Therefore, a complete impact evaluation of the risks to individuals suffering from this condition, and any related mitigation, is neither required nor presented in the TPEIR.

MASTER RESPONSE 2 – USE OF GLYPHOSATE

ISSUES

Some commentors have expressed concern with the implementation of the VBMP on the potential use of herbicides containing glyphosate. The VBMP is a comprehensive strategic plan that directs the priorities of the MCOSD's vegetation management program and does not prescribe the use of any one treatment method, including herbicides. Any description of treatment methods in the VBMP are either describing the MCOSD's current practices or those of other land management agencies. Among the primary concerns is that use of glyphosate formulations have the potential to cause significant harm to human health and the environment. Additionally, some commentors have alleged that glyphosate is persistent in the environment and its use would eventually lead to toxic levels of buildup.

Additional concerns regarding glyphosate include the glyphosate evaluation by the Institute for Research on Cancer (IARC), which recently classified glyphosate as a probable human carcinogen. In light of IARC's conclusions, the Office of Environmental Health Hazard Assessment (OEHHA) also announced its intent to list glyphosate on the Proposition 65 List.

RESPONSE

Since its use first began in 1974, glyphosate has become the most widely used and among the most comprehensively evaluated herbicides. [14] In its more than 40 years of use, it has served as an important agricultural and environmental management tool in more than 160 countries worldwide. Given its widespread and extensive history of use, it has also been the subject of

[12] NAP (National Academy Press). 2009. *Science and Decisions: Advancing Risk Assessment*.

[13] Rodricks, J.V. and J.I. Levy. 2013. *Science and Decisions: Advancing Toxicology to Advance Risk Assessment. Toxicological Sciences*: 131 (1) pages 1-8.

[14] C. M. Benbrook. 2016. *Trends in glyphosate herbicide use in the United States and globally. Environmental Sciences Europe*. 28:3. Available: http://enveurope.springeropen.com/articles/10.1186/s12302-016-0070-0.

extensive research and repeated safety assessments by regulatory authorities throughout the world. [15] [16] [17] [18] The broad consensus within the scientific and regulatory community is that glyphosate's use as an herbicide does not pose significant harm, if any, to human health or the environment.

In the sections below the major topics of concern regarding glyphosate and its potential use as an environmental management tool is addressed.

IARC Conclusions

The International Agency for Research on Cancer (IARC) is an intergovernmental agency forming part of the World Health Organization (WHO) and is one of four WHO programs that have reviewed glyphosate. On March 20, 2015, the International Agency for Research on Cancer (IARC) issued a statement that re-classified glyphosate as "probably carcinogenic to humans". [19] According to IARC, there was "limited evidence of carcinogenicity in humans for non-Hodgkin lymphoma. The evidence in humans is from studies of exposure, mostly agricultural, in the USA, Canada, and Sweden published since 2001. In addition, there is convincing evidence that glyphosate can also cause cancer in laboratory animals."

IARC's conclusions fall in direct contrast to the three other WHO programs that evaluated glyphosate. These three programs, the International Programme on Chemical Safety (IPCS), Core Assessment Group (CAG), and Guidelines for Drinking-water Quality, all concluded that glyphosate does not present a cancer or human health risk. [16] [20] [21]

In addition to being internally inconsistent with its sister programs, IARC's conclusions conflict with the overwhelming consensus within the scientific and regulatory community that glyphosate is not or cannot be classified as a human carcinogen based on the available

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[15] U.S. Environmental Protection Agency (USEPA). 1993. *Reregistration Eligibility Decision (RED) for Glyphosate*. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C. Available: https://archive.epa.gov/pesticides/reregistration/web/pdf/glyphosate.pdf.

[16] World Health Organization (WHO). 1994. *Environmental Health Criteria 159 – Glyphosate. International Programme on Chemical Safety*, World Health Organization. Geneva, Switzerland. Available: http://www.inchem.org/documents/ehc/ehc/ehc159.htm.

[17] Germany. 2013. *Renewal Assessment Report (RAR) on the active substance glyphosate prepared by the rapporteur Member State Germany in the framework of Regulation(EU) No 1141/2010*, December 2013. Available: http://dar.efsa.europa.eu/dar-web/provision.

[18] European Food Safety Authority (EFSA). 2015. *Peer Review Report to the conclusion regarding the peer review of the pesticide risk assessment of the active substance glyphosate*. Available: http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/4302.pdf.

[19] International Agency for Research on Cancer (IARC). *Monograph Volume 112: evaluation of five organophosphate insecticides and herbicides*. Available: https://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf.

[20] World Health Organization (WHO) and Food and Agriculture Organization of the United Nations (FAO). 2004. *Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues Rome*, Itality 20-29 September 2004. Available: http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/JMPR/Reports_1991-2006/report2004jmpr.pdf.

[21] World Health Organization (WHO). *2005. Glyphosate and AMPA in drinking-water. Background document for preparation of WHO Guidelines for drinking-water quality*. Geneva, World Health Organization. Available: http://www.who.int/water_sanitation_health/dwq/chemicals/glyphosateampa290605.pdf.

evidence. [15] [16] [17] [18] [20] [21] [22] [23] Many of these agencies have cited differences in methodology and failure to consider the large body of evidence available for glyphosate as the primary reasons why IARC reached such a drastically different conclusion.

In light of IARC's conclusions, the European Food Safety Authority (EFSA) performed a re-assessment of glyphosate. [24] Their re-assessment evaluated a larger body of evidence taking into account a wealth of new studies and data. Their evaluation lead them to conclude that "glyphosate is unlikely to pose a carcinogenic hazard to humans and the evidence does not support classification with regard to its carcinogenic potential". One of the primary reasons cited by the EFSA for reaching a different conclusion is that IARC excluded key studies and failed to consider the full body of evidence available for glyphosate.

The German Federal Institute of Risk Assessment (BfR) and other German safety authorities have also weighed in on IARC's conclusions. [25] They similarly criticize IARC for failure to incorporate the full breadth of glyphosate health data available, noting that "the entire database must be taken into account for toxicological evaluation and risk assessment of a substance and not merely or more or less arbitrary selection of studies.". Additionally, the BfR on behalf of Germany, who is "Rapporteur Member State" responsible for the ongoing re-evaluation process for glyphosate in the EU, conducted their own recent glyphosate re-assessment. In their assessment, they considered over 30 epidemiological studies as compared to IARC's select three. Based on their evaluation, the BfR concluded that "there is no validated or significant relationship between exposure to glyphosate and an increased risk of non-Hodgkin lymphoma or other types of cancer." [25]

Based on the results of its 1993 reregistration review for glyphosate, the U.S. Environmental Protection Agency (USEPA) found that there was sufficient evidence to conclude that glyphosate was not carcinogenic to humans, classifying glyphosate as a Group E carcinogen (evidence of non-carcinogenicity in humans).[15] In a 2013 re-assessment, the USEPA again concluded that glyphosate does not a pose a cancer risk to humans. [26] The USEPA is currently conducting its registration review of glyphosate, a program that re-evaluates all pesticides on a 15-year cycle.

Another important factor to consider is that IARC does not carry out risk assessments, but rather assess the potential of an agent to be carcinogenic. The likelihood and quantity of exposure, which is a fundamental part of evaluating the true risk posed by a chemical, is not considered when classifying agents according to their potential to cause cancer. Their methodology does not take into account how likely a risk an agent poses in real world

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[22] Office of Environmental Health Hazard Assessment (OEHHA). 2007. *Public Health Goals for Chemicals in Drinking Water – Glyphosate. Pesticide and Environmental Toxicology Branch*. Sacramento, CA. Available: http://oehha.ca.gov/water/phg/pdf/GlyPHG062907.pdf.

[23] G.M. Williams, R. Kroes, and I.C. Munro. 2000. *Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans. Regulatory Toxicology and Pharmacology 31*: 117-165 Available: http://www.ncbi.nlm.nih.gov/pubmed/10854122.

[24] European Food Safety Authority (EFSA). 2015. *Conclusion on the peer review of the pesticide risk assessment of the active substance glyphosate*. EFSA Journal. 13(11):4302.

[25] German Federal Institute of Risk Assessment (BfR). 2015. *Does glyphosate cause cancer?* BfR Communication No 007/2015, 23 March 2015. Available: http://www.bfr.bund.de/cm/349/does-glyphosate-cause-cancer.pdf.

[26] U.S. Environmental Protection Agency (USEPA). 2013. *Glyphosate; Pesticide Tolerances*. Federal Register Vol 78 No. 84. Available: https://www.gpo.gov/fdsys/pkg/FR-2013-05-01/pdf/2013-10316.pdf.

scenarios. Simple exposure to a chemical classified as a known, probable, or possible carcinogen by IARC is not an indicator that cancer will or is even likely to develop.

For example, the classification IARC assigned to glyphosate "Group 2A, Probably carcinogenic to humans" also happens to be the same classification the organization gave to consuming red meat, hot mate tea, and working the nightshift.[27] Partaking in any of these consumables or activities does not indicate that cancer will or is likely to develop. Similarly, even exposure to "Group 1, Carcinogenic to humans" agents, which includes alcoholic beverages, estrogen, sunlight, and working as a painter, is not indicative that cancer will or is likely to develop. Instead, these IARC classifications indicate that there is convincing or suggestive evidence that under certain circumstances, however rare, these agents may increase the odds of developing cancer over your lifetime. This qualified classification is a form of hazard evaluation, which is a component of, but should not be mistaken for, risk assessment. Hazards include any agent capable of causing harm. For example, electricity is a widespread technology that has the potential to be extremely hazardous. However, electricity generally poses very little risk as steps have been taken to prevent harmful levels of exposure.

Evaluation of the likelihood that exposure to an agent has to cause harm is the domain of risk assessment. Risk assessment involves both the evaluation of the toxicity of an agent (i.e., the dose that causes harm) and the likely level of exposure. The expected level of exposure is then compared to known toxicity of the agent to inform us whether the agent might pose genuine health dangers, such as cancer. For example, in a recent joint meeting between the WHO and Food and Agriculture Organization of the United Nations (FAO), the carcinogenic risk of dietary and occupational exposure to glyphosate was evaluated.[28] The conclusions of this joint risk evaluation was that (1) the overall weight of evidence indicates that glyphosate and its formulation products are not associated with genotoxic effects, (2) is unlikely to be genotoxic at anticipated dietary exposures, and (3) that the epidemiological evidence from occupational exposures and lack of carcinogenic potential at human-relevant doses in laboratory studies indicates that glyphosate and its formulations are unlikely to pose a carcinogenic risk to humans from occupational exposure.

The risk screening assessment presented in the Draft TPEIR (see pages 253 through 266 of the Draft TPEIR) is also an example of such an approach and evaluates the expected level of harm, if any, posed by the use of glyphosate. Any risks in excess to the thresholds set within the risk screening assessments would be mitigated with Mitigation Measure 5.5-1 to reduce exposure to a less-than-significant impact.

Proposition 65

In 1986, California voters passed the Safe Drinking and Toxic Enforcement Act, better known as California Proposition 65 (Prop 65).[29] Prop 65 requires the State of California publish a list of chemicals known to cause cancer or birth defects or other forms of reproductive harm. These chemicals include additives or pesticide ingredients, food, and drugs. They may also be used in

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[27] International Agency for Research on Cancer. 2016. *Agents Classified by IARC Monographs*, Volumes 1-115. Available: http://monographs.iarc.fr/ENG/Classification/List_of_Classifications_Vol1-115.pdf.

[28] Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). 2016. *Summary Report from the May 2016 Joint FAO/WHO Meeting on Pesticide Residues (JMPR*). Geneva, 9-13. Available: http://www.who.int/foodsafety/jmprsummary2016.pdf.

[29] Office of Environmental Health Hazard Assessment (OEHHA). 2013. *Proposition 65 in Plain Language*. Sacramento, CA. Available: http://oehha.ca.gov/prop65/pdf/P65Plain.pdf.

or byproducts of manufacturing, chemical processing, and construction. The list must be updated at least once a year and has accumulated over 800 chemicals since it was first published in 1987.

Prop 65 requires that businesses provide a "clear and reasonable" warning before knowingly and intentionally exposing anyone to a listed chemical. This "right to know" law enables Californians to make informed decisions about protecting themselves from exposure to these chemicals. Prop 65 also forbids businesses from knowingly discharging significant amounts of listed chemicals into sources of drinking water. The California Office of Environmental Health Hazard Assessment (OEHHA), which is part of the California Environmental Protection Agency (Cal/EPA), is the agency responsible for administering the requirements of the law. OEHHA evaluates all currently available scientific information on substances.

Chemicals may be added to the Prop 65 List through a variety of mechanisms, one of them being the Labor Code mechanism.[30] This mechanism requires substances that have been identified by the International Agency for Research on Cancer (IARC) to be listed under Proposition 65. This mechanism is a strictly ministerial process and does not reflect an exercise of discretion or judgment by OEHHA. Under this listing mechanism, OEHHA does not and "cannot consider scientific arguments concerning the weight or quality of the evidence considered by IARC when it identified these chemicals".[31] It is through this mechanism alone that OEHHA is considering adding glyphosate to the list.

In effect, glyphosate may be added to the Prop 65 list strictly due to ministerial process requirements and not based on the available science. This is a known limitation of Prop 65, which has drawn sharp criticism.[32] Examples of other chemicals that have been added through the Labor Code Mechanism include *Aloe vera* whole leaf extract and goldenseal root powder.[33]

Further, it is important to point out that Prop 65 does not take into account the concept of exposure and therefore does not evaluate risk using the risk assessment process outlined previously. As a result of this limitation, Prop 65 should not be used to characterize the risk of glyphosate.

In conclusion, glyphosate's addition to the Prop 65 List does not necessarily mean it is an actual carcinogen or that it is likely to cause harm. Instead, it reflects a ministerial process that requires OEHHA to follow IARC's lead in lieu of exercising science-based discretion. OEHHA's

[30] Office of Environmental Health Hazard Assessment (OEHHA). *Title 27, California Code of Regulations*, New Section 25904 Listing by Reference to the California Labor Code. Available: http://oehha.ca.gov/prop65/CRNR_notices/072115NewSec25904.html (Accessed: March 29, 2016).

[31] Office of Environmental Health Hazard Assessment (OEHHA). 2015. *Notice of Intent to List Chemicals by the Labor Code Mechanism: Tetrachlorvinphos, Parathion, Malathion, Glyphosate*. Available: http://oehha.ca.gov/prop65/CRNR_notices/admin_listing/intent_to_list/pdf_zip/090415NOIL_LCSet27.pdf.

[32] Natural Products Association (NPA). 2015. Sent Electronically to: P65Public.Comments@oehha.ca.gov. Subject: "*Notice of Intent to List Chemicals by the Labor Code Mechanism: Aloe Vera, Whole Leaf Extract and Goldenseal Root Powder*". Available: http://oehha.ca.gov/prop65/CRNR_notices/admin_listing/intent_to_list/pdf_zip/062015comment32.pdf.

[33] Office of Environmental Health Hazard Assessment (OEHHA). 2015. *Chemicals Listed Effective December 4, 2015 as Known to the Statue of California to Cause Cancer: Aloe Vera, Non-decolorized Whole Leaf Extract and Goldenseal Root Powder*. Available: http://oehha.ca.gov/prop65/CRNR_notices/list_changes/120415listAloeGoldenseal.html (Accessed: March 29, 2016).

conclusions are in no way indicative that the use of glyphosate-based herbicides with implementation of the VBMP would pose a significant health risk.

Human Health and Safety

The human health effects and safety of glyphosate-based herbicides are among the most thoroughly evaluated in the scientific, regulatory, and risk assessment literature. Government regulatory agencies worldwide, international organizations, and various scientific institutions and experts have reviewed the available scientific data and have independently and repeatedly concluded that glyphosate-based herbicides are safe to use. [15-18] [20-25]

Five of the most prominent governmental regulatory and health organizations (U.S. Environmental Protection Agency, Health Canada, European Food Safety Authority, German Institute for Risk Assessment, and the World Health Organization) have evaluated the potential human health risks of glyphosate. [15-18 20 21 24 25 34] According to their evaluations, which were based on the application of internationally accepted methods, principles, and procedures in toxicology and exposure science, there are no grounds to suggest use of glyphosate-based herbicides is a concern to human health. It should be noted that IARC, which is an agency within the WHO, evaluates whether an agent is capable of producing cancer but does not evaluate exposure or how likely adverse effects are to occur or whether chemicals are a concern to human health.

In a recent Herbicide Risk Assessment by the Marin Municipal Water District (MMWD), the risk of ground spray, backpack spraying, and cut-stump applications of glyphosate-based herbicides to herbicide applicators and the general public was assessed. [35] General public exposure scenarios evaluated included contacting contaminated vegetation on or near the application site, eating contaminated fruit or fish, or drinking contaminated water. In addition, accidental exposure to the general public were evaluated including extremely unlikely exposure scenarios such as direct, whole body spray of a child, and a child consuming water from a pond contaminated by a 20 gallon spill. Risk to herbicides applicators was evaluated for both general and accidental exposures that might occur, such as wearing accidentally contaminated gloves for up to an hour, direct spray onto hands, and direct spray to lower legs. Both acute and chronic exposure scenarios were evaluated to obtain a range of exposure estimates for both worst-case and more probable scenarios.

Of all the scenarios analyzed, only the highly improbable scenario in which a child drinks from a thermally stratified pond contaminated with concentrated product resulted in any potential unacceptable risk (i.e., a Hazard Quotient greater than 1). All other scenarios, even the highly improbable, direct full body spray of a child, were below the level that indicates the potential for unacceptable risk (i.e., Hazard Quotients less than 1) even under worst case scenario assumptions. More probable scenarios, such as contact with treated vegetation or consumption of fish, indicated that exposures were all exceedingly far below the level of concern and that no unacceptable risk was present.

MMWD's risk assessment results are directly applicable to the draft VBMP as sufficiently similar methods of applications to those proposed in the draft VBMP were evaluated in the MMWD's

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[34] Health Canada. 2015. *Proposed Re-evaluation Decision PRVD2015-01, Glyphosate*. Pest Management Regulatory Agency. Available: http://publications.gc.ca/collections/collection_2015/sc-hc/H113-27-2015-1-eng.pdf.

[35] Marin Municipal Water District (MMWD). 2010. *Marin Municipal Water District Herbicide Risk Assessment*. Available: https://www.marinwater.org/183/Wildfire-Protection-Habitat-Improvement.

assessment of glyphosate. Additionally, there is significant similarity in environmental conditions between the MCOSD preserves and that of Marin Municipal Water District. Thus, the potential risk to the general public and herbicides applicators through exposure due to VBMP activities, as was determined by the MMWD, is insignificant.

Despite glyphosate's wide used and human exposure being commonplace, poisonings are very rare primarily because glyphosate is not well absorbed through the skin or by inhalation, the main routes of exposure. This low rate of absorption also accounts for the low to non-detectable levels of glyphosate found in urine in biomonitoring studies. [35] Most reported cases of acute health effects involve irritation to the skin and eyes. [35]

Finally, all herbicides, including glyphosate, are regulated to promote safety and must be registered by the USEPA. In California, herbicides must also undergo registration by the California Department of Pesticide Regulation (CDPR). Herbicide registration is the process through which the USEPA and CDPR examines the ingredients of the herbicides; the intended sites for its use; the amount, frequency, and timing of its use; and storage and disposal practices. During this process, the USEPA and CDPR evaluates the herbicide to assess effects on humans, the environment, and non-target species. Before any herbicide may be sold, distributed, or used within the U.S. and in California, it must pass through the registration process and any adverse impacts must be mitigated. Once registered, the herbicide may not legally be used unless the use is consistent with the approved directions for use on the herbicide's label. When herbicide label directions are followed, significant adverse effects on humans, the environment, and non-target species are not expected.

Endocrine Disruption

Although endocrine disrupting chemicals are generally considered to have the potential to cause adverse effects, considerable uncertainty exists regarding the relationship between endocrine disruptor exposure and adverse health outcomes. In many cases, only screening level data are available to indicate the potential for a chemical to interact with the endocrine system in a way that may produce an adverse effect. [36] In general, these and other forms of endocrine disruptor data are not sufficient to use in a risk assessment. For a well-studied chemical such as glyphosate, however, there is a sufficient base of empirical data to evaluate its endocrine disrupting potential.

In a recent weight of evidence assessment, the U.S. Environmental Protection Agency (USEPA) evaluated the endocrine disrupting potential for glyphosate by examining its interactions with estrogen, androgen, and thyroid signaling pathways. [37] Interactions evaluated include agonism and antagonism at the estrogen and androgen receptors, altered steroidogenesis, and hypothalamic-pituitary-gonadal (HPG) and hypothalamic-pituitary thyroid (HPT) axes. Other scientifically relevant information (OSRI), such as general toxicity data and open literature studies of sufficient quality, were also considered in the weight of evidence assessment.

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[36] U.S. Environmental Protection Agency (USEPA). 2011. *Endocrine Disruptor Screening Program (EDSP) Overview. Office of Chemical Safety and Pollution Prevention*. Available https://www.epa.gov/endocrine-disruption/endocrine-disruptor-screening-program-edsp-overview (Accessed: March 29, 2016).

[37] U.S. Environmental Protection Agency (USEPA). 2015. *EDSP Weight of Evidence Conclusions on the Tier 1 Screening Assays for the List 1 Chemicals*. Office of Chemical Safety and Pollution Prevention. Washington, D.C. Available: https://www.epa.gov/sites/production/files/2015-06/documents/glyphosate-417300_2015-06-29_txr0057175.pdf.

In evaluating glyphosates interactions with the estrogen, androgen, and thyroid signaling hormone pathways, the USEPA considered the number and type of effects induced, the magnitude of responses, and the pattern of responses observed across studies, taxa, and sexes. Additionally, whether endocrine-related responses occurred at dose(s) that also resulted of general systemic toxicity or overt toxicity was considered.

Based on weight of evidence considerations, the USEPA concluded there is no convincing evidence that glyphosate has the potential to interact with estrogen, androgen, or thyroid hormone pathways in mammalian or wildlife receptors. [37] Thus, the use of glyphosate as conducted by the MCOSD is not anticipated to cause endocrine disrupting related adverse health effects.

Environmental Fate

Understanding how a chemical moves around and transforms in the environment is fundamental to characterizing the human and environmental risk for any chemical(s), including herbicides, as it directly influences the likelihood and magnitude of exposure. Relevant aspects of the chemical must be considered in this characterization, including transport through various environmental media (e.g., air, water, soil, etc.), partitioning, degradation, biological transformation, and uptake by biota, in order to develop a full understanding of the chemical's destiny in the environment, more commonly known as its "environmental fate".

Before an herbicide, such as glyphosate, may be registered for use, it must first undergo rigorous studies to evaluate its environmental fate after release, either from an intended use or an accidental release, such as a spill. These studies are reviewed by the USEPA, CDPR, and other regulatory agencies worldwide. Their evaluation feeds directly into assessments of risks that ultimately guide their decision on whether an herbicide is safe to register or not.

The environmental fate of glyphosate-based herbicides is one of the most evaluated and well understood amongst herbicides. This vast database of knowledge was considered by the USEPA and CDPR when it decided that glyphosate-based herbicides were safe to register for use.

Glyphosate is known to degrade primarily through biotic metabolism by microbes and fungi in or on the soil and in surface water. [38] Other forms of degradation, such as photodegradation in water and air, are not expected to contribute significantly to glyphosate degradation.

When glyphosate degrades in soil and water, its primary degradate is aminomethylphosphonic acid (AMPA). [38] AMPA also further degrades to naturally-occurring compounds such as carbon dioxide and phosphate. The acute oral and dermal toxicity of AMPA has been evaluated in laboratory studies with rats and mice. [39] The results indicate that AMPA has very low acute toxicity to mammals. Other ecotoxicology studies characterizing AMPA's toxicity to aquatic and terrestrial species indicate that AMPA has little toxicity to non-target organisms. [38]

In the soil, glyphosate is predominantly degraded through biodegradation, which is mediated primarily by bacteria and fungi.[38] Consequently, the rate of decrease of glyphosate

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38 J.P. Giesy, S. Dobson, and K.R. Solomon. 2000. *Ecotoxicological Risk Assessment for Roundup ® Herbicide*. Rev Environ Contam Toxicol 167:35-120.

39 G.M. Williams, R. Kroes, and I.C. Munro. 2000. *Safety evaluation and risk assessment of the herbicide Roundup® and its active ingredient, glyphosate, for humans*. Regulatory Toxicology and Pharmacology 31(2): 117-165.

concentrations in the soil depends on the overall microbial activity of the soil. [40 41] Field studies indicate that glyphosate typically degrades rapidly in a variety of ecosystems, including simple ones such as agriculture to more complex ecosystems such as forest, regardless of the diverse soil and climatic conditions. [42 43 44 45] The rate at which a chemical degrades in the environment is measured by its half-life (i.e., the time required for half of the applied chemical to degrade). Based on a meta-analysis of 47 soil degradation studies conducted in diverse soil conditions, the average half-life for glyphosate was estimated to be 32 days. [38] The degradation of glyphosate in broom-infested soil in Mt. Tamalpais of Marin County was also investigated by the University of California, Davis. [46] Their study reported glyphosate and AMPA half-lives of 44 and 46 days, respectively. Other studies report glyphosate soil half-lives that are shorter (three days) or longer (two years). Although soil degradation rates may vary considerably at different sites, for the majority of soil conditions, less than ten percent of applied glyphosate is expected to remain six months after application.

Glyphosate that remains in the soil or sediment binds very tightly to the soil or sediment matrix, rendering it inactive.[44] Relative to other herbicides, glyphosate has very strong soil- and sediment-binding potential due to its strong organic carbon-water partitioning coefficient (K_{oc}). A chemical's K_{oc} represents the ratio of the mass of a chemical that adsorbs to the soil or sediment per mass of unit of organic carbon in the soil or sediment. Higher K_{oc} values signify a stronger tendency to bind to soil or sediment.

Exhibit 8.0-1 shows representative K_{oc} values for several commonly used herbicides gathered from the National Pesticide Information Center (NPIC) OSU Extension Pesticide Properties Database [47] and represents the relative strength with which they are expected to bind to soil and sediment:

Exhibit 8.0-1 Representative K_{oc} Values

Active Ingredient	K_{oc} (L/kg)
Triclopyr (amine salt)	20
2,4-D esters	80

[40] S.M. Carlisle and J.T. Trevors. 1988. *Glyphosate in the environment*. Water Air Soil Pollut 39:409-420.

[41] L.J. Moshie and D. Penner. 1978. *Factors influencing microbrial degradation of ^{14}C-glyphosate to $^{14}CO_2$ in soil*. Weed Sci 26:686-691.

[42] M. Newton, K.M Howard, B.R. Kelpsas, R. Danhaus, C.M. Lottman, and S. Dubelman. 1984. *Fate of glyphosate in an Oregon forest ecosystem*. J Agric Food Chem 32(5):1144-1151.

[43] M.T.H. Ragab, M.K.H. Abdel-Kader, D.A. Stiles. 1985. *Fate of glyphosate in a sandy loam soil and analysis for residues in field-grown crops*. Proc N S Inst Sci 35:67-70.

[44] California Department of Pesticide Regulation (CDPR). 1998. *Environmental Fate of Glyphosate. Environmental Monitoring & Pest Management*. Sacramento, CA. Available: http://www.cdpr.ca.gov/docs/emon/pubs/fatememo/glyphos.pdf.

[45] J.C. Feng and D.G. Thompson. 1990. *Fate of glyphosate in a Canadian forest watershed*. 2. Persistence in foliage and soils. J Agric Food Chem 38:1118-1125.

[46] University of California, Davis. 2010. *Environmental Decay of Glyphosate in Broom-Infested Mt. Tamalpais Soils*. Department of Civil and Environmental Engineering.. Davis, CA. Available: https://www.marinwater.org/DocumentCenter/View/244-

[47] National Pesticide Information Center (NPIC). 1994. *OSU Extension Pesticide Properties Database*. Available: http://npic.orst.edu/ingred/ppdmove.htm (Accessed: March 29, 2016).

Active Ingredient	K_{oc} (L/kg)
Atrazine	100
Sethoxydim	100
Alachlor	170
Pendimethalin	5,000
Fluazifop-p-butyl	5,700
Trifluralin	8,000
Glyphosate	**24,000**
Oxyfluorfen	100,000

Source: National Pesticide Information Center, 1994.

The stronger an herbicide binds to the soil and sediment, the less bioavailable it is. Bioavailability refers to the proportion of a chemical that is free to be absorbed by and potentially affect an organism. Glyphosate is not readily bioavailable in the soil or sediment due to its high K_{oc} and soil and sediment binding potential. This characteristic reduces the likelihood of hazardous exposure to humans and wildlife that come into contact with treated soils. Glyphosate's high soil-binding potential also reduces its toxicity non-target plants as glyphosate is not bioavailable for uptake by the roots of neighboring non-target plants. Evidence also suggests that glyphosate, when applied according to the label directions, is not harmful to soil biota, such as microbes, earthworms, and other soil-dwelling organisms. [38]

Glyphosate also dissipates rapidly in aquatic environments due to a combination of factors including microbial degradation, dispersion, and loss through processes such as adsorption to suspended particulate matter or sediments. [38] The primary microbial degradation products of glyphosate in water are AMPA and carbon dioxide. In flowing water systems, tributary dilution may also contribute to glyphosate dissipation. In non-flowing water systems, such as ponds, the rate of glyphosate dissipation is more dependent on local chemical, physical, and biological conditions and is therefore considered site specific. Based on analysis of field and laboratory studies, a conservative range of aquatic half-life values has been estimated to be from seven to 14 days. [38] Half-lives of AMPA are considered comparable to that of glyphosate.

Glyphosate's relatively high degradation rate in soil and water, in addition to its strong soil- and sediment-binding potential (i.e., relatively high K_{oc}), prevents it from leaching through the soil and into groundwater. This is evidenced by the fact that glyphosate has rarely been detected in groundwater. [48]

The same properties that limit leaching to groundwater (i.e., high degradation rate and K_{oc}) also limit the amount of glyphosate that is transported to surface waters via runoff. In a three-year study evaluating glyphosate transport from agricultural fields to surface water, less than one percent of applied glyphosate was typically lost as runoff when the recommended application rate was applied. [49] The maximum amount of glyphosate transport by runoff observed by the study occurred in a field treated at twice the recommended application rate with a severe

[48] California Department of Pesticide Regulation (CDPR). 2015. *Annual Well Sampling Report*. Available: http://www.cdpr.ca.gov/docs/emon/grndwtr/wellinv/wirmain.htm (Accessed: March 30, 2016).

[49] W.M. Edwards, G.B. Triplett, and R.M. Kramer. 1980. *A watershed study of glyphosate transport in runoff*. Journal of Environmental Quality 9(4):661-665.

rainstorm occurring one day after application. Despite this naturally-occurring, worse-case scenario, only a loss of 1.85 percent of applied glyphosate to surface water was reported. Additionally, glyphosate's strong soil-binding potential indicates that, when glyphosate-containing soil particles are washed or blown into surface waters, virtually all of glyphosate will remain adsorbed to the particle surface and not be released into water. Glyphosate-containing soil particles will eventually settle to the bottom of the sediment, where glyphosate is degraded overtime by microorganisms. [44] Studies also report that glyphosate has no short- or long-term adverse effects on sediment-dwelling organisms. [50]

Laboratory studies indicate that glyphosate has low potential to bioaccumulate in both aquatic and terrestrial species. [23] [38] Limited data also suggests that glyphosate has little to no potential to bioaccumulate in forested conditions. [44] Other studies indicate that glyphosate is rapidly metabolized and eliminated from various animal species, including mammals, birds, and fish, with minimal tissue retention. [44]

The vapor pressure of glyphosate is extremely low, rendering the volatilization fate exposure pathway virtually non-existent. [44] With exposure being insubstantially low, exposure to volatilized glyphosate is not a significant factor to consider when evaluating the risk of glyphosate.

When any sprayed substance is used, it is possible that minute quantities of mist, drip, drift, or splash of product onto non-target vegetation may occur. This process is known as aerial drift and is a factor to consider when evaluating the fate of glyphosate-based herbicides, as spray droplets could theoretically drift off-target during application. The MCOSD will continue to implement drift control best management practices (BMPs) as presented in the California Invasive Plant Council (Cal-IPC) recently published guide *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*. [51] [52]These BMPs include, but are not limited to, the use of adjuvants to reduce spray drift, low-pressure and large droplet nozzles, using pulsed application techniques where applicable, and using more targeted application methods (e.g., spot treatments, backpack sprayers, cut stump, etc.) where appropriate. These measures minimize the effects of spray drift. Additionally, all applications as discussed in the draft VBMP would be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years to maintain currency and are trained in the techniques to minimize drift, such as proper selection of nozzle and pressure. The combination of following herbicide label directions, implementing the appropriate BMPs, and applying under the guidance of a well-trained QAL/QAC, the risk due to drift of glyphosate-based herbicides is insignificant.

The environmental fate properties of glyphosate-based herbicides are well researched and understood. Glyphosate is readily biodegraded via microbes in both soil and water to naturally occurring compounds. Its high soil- and sediment-binding potential render it unlikely to reach

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[50] C.A. Simenstad, J.R. Cordell, L. Tear, L.A. Weitkamp, F.L. Paveglio, K.M. Kilbride, K.L. Fresh, and C.E. Grue. 1996. *Use of Rodeo ® and X-77 ® Spreader to Control Cordgrass (Spartina alterniflora) in a Southwestern Washington Estuary*: 2. Effects on Benthic Microflroa and Invertebrates. Environmental Toxicology and Chemistry 15(6):969-978.

[51] California Invasive Plant Council (Cal-IPC). 2015. *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. Available: www.cal-ipc.org.

[52] Email from Pete Frye, MCOSD to David Bonnar, Blankinship and Associates, April 11, 2016.

groundwater, reduce its bioavailability in the soil to non-target plants, and prevents its release into water when glyphosate-containing particles are transported to surface water via runoff or erosion. Glyphosate containing particles that reach surface water settle to the sediment where glyphosate is safely biodegraded. Glyphosate's substantially low volatility prevents it from moving offsite during or after application. Glyphosate is rapidly metabolized and unlikely to bioaccumulate in both terrestrial and aquatic organisms. When applications are made according to label directions, under the guidance of a licensed QAL/QAC, and with the implementation of the BMPs described previously, the risk due to drift of glyphosate-based herbicides is insignificant.

Effects on Wildlife

Before an herbicide, such as glyphosate, may be registered for use, it must first undergo rigorous studies to evaluate its potential to produce adverse effects on wildlife and non-target organisms. These studies are conducted with species that are considered representative of several major categories of wildlife and non-target organisms including birds, fish, aquatic invertebrates, small mammals, honey bees, algae, and aquatic plants. These studies are reviewed by the USEPA, CDPR, and other regulatory agencies worldwide. Their evaluation feeds directly into assessments of risks which ultimately guide their decision on whether an herbicide is safe to register or not.

When the U.S. Environmental Protection Agency (USEPA) reregistered glyphosate for use back in 1993, it concluded that "Based on the current data, it has been determined that effects [of glyphosate] to birds, mammals, fish and invertebrates are minimal". [15] Since its most recent reregistration in 1993, numerous studies have been conducted evaluating the potential effects of glyphosate and glyphosate-containing herbicides on wildlife. The weight of evidence when considering all those studies supports the USEPA's original conclusion that glyphosate-based herbicides are unlikely to produce adverse effects on wildlife when label directions are followed.

In a recent Draft Herbicide Risk Assessment by the Marin Municipal Water District (MMWD), the risk of ground spray, backpack spraying, and cut-stump applications of glyphosate-based herbicides to wildlife was evaluated. [53] In the majority of exposure scenarios evaluated, hazard quotients (HQ) for all wildlife were well below one, indicating that glyphosate poses low or virtually no risk to wildlife when used as an herbicide. These low HQs were also frequently observed in high exposure, worst-case scenario evaluations. The only scenarios where HQs exceeded one (i.e., indicating the potential for risk) for terrestrial wildlife were upper estimates of small mammals consuming herbicide contaminated insects and large birds consuming treated vegetation shortly after application. For aquatic wildlife, HQs exceeded one only under accidental conditions (e.g., spilling of diluted or concentrated product into a nearby body of water).

The results of MMWD's wildlife risk assessment are highly applicable to the draft VBMP as sufficiently similar methods of applications to those proposed in the draft VBMP were evaluated in the MMWD's assessment of glyphosate. Additionally, there is significant similarity in environmental conditions between MCOSD's preserves and that of Marin Municipal Water District. Thus, the potential risk to wildlife through exposure to applied herbicides, as proposed in the draft VBMP is insignificant.

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[53] Marin Municipal Water District (MMWD). *2010. Herbicide Risk Assessment: Chapter 3 - Glyphosate*. Available: https://www.marinwater.org/183/Wildfire-Protection-Habitat-Improvement.

In addition to the in-depth risk assessment conducted by the USEPA, CDPR, and other agencies which strongly indicate glyphosate is unlikely to cause harm to wildlife, a screening-level risk assessment was conducted as a part of the evaluation of the draft VBMP. Screening-level risk assessments are conservative assessments that provide a high degree of confidence in determining low likelihood of adverse effects (i.e. predicting situations that are not likely to cause harm to humans or the environment), and they incorporate uncertainty in a precautionary manner. As results generated in screening-level risk assessments are conservative in nature, they are not designed nor intended to provide definitive estimates of actual risk as they are not based upon site-specific assumptions and likely over-estimate the actual risk. In most cases, risk is evaluated through a tiered process with multiple iterations of risk evaluation beginning with highly conservative, worst-case assumptions then further investigating and refining model parameters and assumptions to better reflect reality with higher tiers of analysis. Thus, failure to pass first tier, screening-level risk assessments does not necessarily indicate actual risk, but instead reflects the potential for risk and the need to progress to a higher tier analysis. As discussed previously, less conservative, more site-specific in-depth risk assessments have been conducted for glyphosate-containing herbicides, such as the risk assessment conducted for MMWD. The results of those risk assessments indicate that glyphosate-containing herbicides are unlikely to cause harm to wildlife when the label is followed and even in extreme accidental exposure scenarios such as spills.

As discussed in **Impact 5.5-1** (*Impacts to Ecological Receptors*) despite the highly conservative nature of the risk-screening analysis, 22 out of 28 (80 percent) of the application scenarios evaluated for the draft VBMP showed no or less-than-significant impacts. All scenarios evaluated indicated very low likelihood of impacts (i.e., no or less-than-significant impact) to mammals, terrestrial-phase amphibians, reptiles, soil invertebrates, and birds. The potential for risk was only concluded in a few select cases, mostly to aquatic organisms. In those cases where the potential for risk in this screening-level risk analysis was concluded (i.e., considered a significant impact), mitigation measures are proposed (see Mitigation Measure 5.5-1) to reduce impacts associated with herbicide use to no or a less-than-significant impact. These mitigation measures implement a 100-foot buffer zone limiting herbicide use and exposure by either A) avoiding the use of herbicide entirely within the zone or, B) restricting herbicide to the least harmful application methods (e.g., targeted application methods such as foliar spot spray). Where buffer zones or the least harmful application methods are not feasible, preparation of a treatment program that considers site-specific conditions, threats, and benefits to sensitive natural resources while incorporating the latest adaptive management practices will result in no additional significant impact. Additionally, the BMPs published by Cal-IPC discussed earlier would be also implemented to further protect sensitive wildlife and all applications as proposed in the draft VBMP would be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holder.

Certain formulations of glyphosate contain labels with language indicating that it may be applied directly to water. These formulations are referred to as “aquatic approved” products. Additionally, label language may also allow for applications near (typically less than 100 feet) water bodies such as in riparian areas. Products that may be applied in (i.e., aquatic approved) or near water bodies generally pose less of a risk to aquatic animals. The MCOSD uses only glyphosate products that are “aquatic approved”. Additionally, although these products are registered for aquatic use, applications made by the District are frequently made far from surface water (greater than 100 feet). Based on glyphosate’s naturally low aquatic toxicity and common MCOSD practices, the use of aquatic approved, glyphosate-containing herbicides as proposed in the draft VBMP is not anticipated to pose unreasonable risk to aquatic organisms.

In summary, risks to wildlife are evaluated by the USEPA and CDPR before registering an herbicide product for use. When registering a product for use, the USEPA and CDPR approve labels with directions that are explicitly designed to avoid exposing sensitive wildlife to hazardous levels of herbicide. When used according to label directions, the anticipated use of the product is not likely to have significant impacts to wildlife. Risks analyses by other agencies, such as the MMWD, provide further evidence that glyphosate-based herbicides are unlikely to cause harm to wildlife, even in extreme accidental events, such as spills. Environmentally protective practices employed by the MCOSD, such as the use of only “aquatic approved” glyphosate products and implementation of Cal-IPC BMPs, provides for a proactive approach to risk management. Finally, the highly conservative risk-screening analysis conducted as a part of the draft TPEIR and resulting mitigation measures provide significant protection of wildlife from application of glyphosate-based herbicides.

Effects on Non-target Plants

By design, herbicides are intended to be toxic to plants. As a broad spectrum herbicide, any unintended direct spray or substantial off-target spray drift with glyphosate will likely result in damage to non-target vegetation. Glyphosate is unlikely to have any significant residual herbicidal activity, however, as its high soil-binding potential causes it to adsorb strongly to the soil rendering it poorly adsorbed through plant roots.

The likelihood of unintended direct contact with herbicide and off-target spray drift is related to a variety of factors including the method of application, the use of drift retarding agents, the weather, and care by the applicator. For basal bark, cut-stump, and hack-and-squirt applications, exposure to non-target plants is not expected, and therefore, no additional mitigation measures would be required. Rope-wick and foliar applications may result in exposure through direct contact with rope-wicks containing herbicide, direct spray, or off-target spray drift. However, if sensitive natural resources such as an occurrence of special-status plant population or sensitive natural community type were present in the treatment area, this could result in significant impact through inadvertent direct spray or spray drift exposure.

In order to ensure that significant exposure to non-target plants does not occur as a result of foliar and rope wick applications, Mitigation Measure 5.5-1 would be implemented. Through the use of buffer zones and least harmful application methods (e.g. spot spray treatments), exposure to non-target plants through drift, runoff, erosion, and direct contact would be significantly reduced or prevented entirely. Where buffer zones or the use of least harmful application methods are not feasible, preparation of a treatment program that considers site-specific conditions, threats, and benefits to sensitive natural resources while incorporating the latest adaptive management practices would ensure that there is no additional impact.

In addition to implementation of Mitigation Measure 5.5-1, the MCOSD will continue to implement BMPs as described by Cal-IPC. [51] These BMPs include, but are not limited to: (1) the use of adjuvants and low-pressure and large droplet nozzles to reduce spray drift, ; (2) adding marker dye to herbicide mixtures to aid in preventing drift or mis-application to non-target plants; (3) use of tools such as brush hooks to concentrate target foliage, to move it away from non-target plants, and reduce overspray; and (4) flagging native plants and/or plants to be treated if feasible. Additionally, all applications as proposed in the draft VBMP would be performed under the supervision of a QAL/QAC holder who receives bi-annual training on techniques to minimize drift and reduce exposure to non-target species. Recommendations on the herbicide to be used will be made by a Pest Control Advisor (PCA) who, based on education and training, is licensed by the CDPR. To maintain currency on methods of resource protection, herbicide efficacy, and related topics, PCAs must undergo no less than 40 hours of training every two years.

Through implementation of Mitigation Measure 5.5-1 together with the additional BMPs described above by Cal-IPC, the impact of glyphosate-based herbicide exposure to non-target plants would not be significant.

MASTER RESPONSE 3 – ALTERNATIVES TO HERBICIDE USE

ISSUES

The MCOSD received letters and comments expressing support for an approach that does not include the use of herbicides, a No Herbicide Alternative. Additionally, some comments suggest that pesticides should only be used as a last resort after finding other methods are not feasible, or were critical of the range of alternatives evaluated in the draft TPEIR.

RESPONSE

Range of Alternatives

The primary purpose of the VBMP is to provide a comprehensive, long-term plan for vegetation management. Its objectives are to:

- *Guide a science-based approach to vegetation management that will protect the natural biodiversity of the preserves, maintain public access, and manage fuel loads.*
- *Coordinate all aspects of vegetation management, including invasive plant control, needs for access, and fuel management, across all the MCOSD preserves, to improve program effectiveness and efficiency.*
- *Provide the foundation for a systematic approach to priority setting, budgeting, and staffing, to further improve program efficiency and effectiveness over the long term.*[54]

In other words, the purpose of the VBMP is to create a strategic system for implementing the MCOSD's vegetation management program. Without the plan, the District would not have any system for setting priorities, improving effectiveness, or efficiently operating the program. Currently, priorities are set by political, public, or other pressures that do not necessarily focus the vegetation management program on the highest priority or on the most effective action. The VBMP is the MCOSD's process to provide a strategic structure for the implementation of its vegetation management program.

Other than requiring the use of an integrated pest management (IPM) approach, the draft VBMP does not direct the implementation of various vegetation management projects. IPM is a science-based decision-making system that uses a specific methodology to manage damage from pests, including invasive plants. The goal of the IPM is to use the most effective and least environmentally harmful options to manage invasive plants.

Pursuant to CEQA, an EIR should include reasonable alternatives to the project that would feasibly attain most of the basic objectives of the project (*State CEQA Guidelines*, Section

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[54] Marin County Open Space District, Marin County Parks, *Vegetation and Biodiversity Management Plan,* April 2015 Draft, page 1-5.

15126.6(a)). Additionally, the *State CEQA Guidelines* does not require consideration of every conceivable alternative (*State CEQA Guidelines*, Section 15126.6(a)). The MCOSD relied on the "Rule of Reason" in selecting the alternatives for consideration in the EIR:

> The range of alternatives required in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision making (*State CEQA Guidelines*, Section 15126.6 (f)).

The VBMP is a comprehensive strategic plan aimed at improving the effectiveness and efficiency of the MCOSD's vegetation management program. The No Herbicide Alternative does not meet the objectives of the VBMP. Additionally, successful management of invasive plants using Integrated Pest Management (IPM) by MCOSD requires that land managers consider a variety of treatments, including the use of herbicides. Exclusion of herbicides from the IPM toolkit would significantly inhibit effectiveness of the VBMP and reduce the MCOSD's ability to select the least harmful method available. Therefore, as part of a proper IPM approach, herbicides cannot be excluded and a no-herbicide use alternative is not considered.

Integrated Pest Management

According to the UC Davis, Integrated Pest Management (IPM) is "an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organisms. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment."[55] The IPM approach considers information about the pest biology, its life cycle, and its interaction with the environment, and all appropriate pest management options when designing a treatment program. Implementation of IPM frequently results in the use of a combination of strategies including manual and mechanical methods, herbicides, grazing, prescribed burning, and biological control.

When selecting the most appropriate invasive plant control methods, wildland managers must consider and balance a wide variety of factors including efficacy, ease of use, and cost as well as potential impacts to non-target organisms, the environment, and human and ecological health. The most common management options employed by wildland managers involve a combination of manual, mechanical, and chemical control methods.[56] These land managers also use other methods, such as grazing, prescribed fire, and biological control.

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[55] University of California, Davis (UC Davis). 2014. *Definition of Integrated Pest Management*. UC Davis Integrated Pest Management Program. Available: http://www.ipm.ucdavis.edu/GENERAL/ipmdefinition.html.

[56] California Invasive Plant Council (Cal-IPC). 2015. *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. Available: www.cal-ipc.org.

Each control method has inherent advantages and disadvantages, and each method has the potential to produce undesirable impacts and non-target effects. For example, grazing goats, sheep, or cattle may damage desirable vegetation and compact soil and the use of mowers and other gas powered machines emit greenhouse gases or other air pollutants that can have negative consequences to the environment. For each control method, there are situations where it is appropriate to use and others where it is not.

A commonly employed method of weed control are the mechanical methods, a broad category of control which includes pulling, cutting, excavating, or physically damaging plants. [56] Various equipment may be used depending on the species and size of infestation needing control including hand tools (e.g. saws, pruners, weed wrenches or spades) or power tools (e.g. chain saws, power mowers, tillers, excavators, or backhoes). The use of mechanical methods is desirable as it tends to be very precisely targeted and does not require extensive training to use many of the tools. However, there are situations where the use of mechanical methods alone is not practical or efficacious. For example, plants that resprout from roots or reproduce from fragments left behind are very difficult to control using only mechanical methods. Soil compaction or damage to non-target plants and organisms may also occur when heavy equipment is employed, and pulling plants out by the root frequently results in significance disturbance to the soil which can result in promoting the re-growth or re-invasion of invasive plants. Additionally, mechanical methods can be costly, labor-intensive, and physically demanding. Additionally, many tools require substantial training and may injure workers if proper care is not taken in their use. [57] Mechanical control methods may be appropriate and selected for use depending on environmental conditions or landowner preferences, and, due to the likelihood of physical harm or disturbance, may be prohibited near threatened or endangered species.

The use of herbicides is also a widely employed invasive plant management method. Based on a 2012 Cal-IPC survey of wildland managers, 72 percent of wildland managers said that they "frequently" or "always" use herbicides for invasive plant control while 28 percent said they rarely or never use herbicides. Among the reasons herbicides may be preferentially used is that they are economical, highly efficacious, and able to target specifically the plants of concern while avoiding non-target impacts. In contrast to manual and mechanical methods, it also avoids ground disturbance and other physical impacts to the habitat and poses less risk of physical injury for workers. Reasons why herbicide control may not be selected in particular situations is that there is the potential for non-target impacts, especially on plants with similar biology, and that use of herbicides requires particular expertise, capacity, and legal requirements. Before an herbicide may be used, it is generally required that a written recommendation from a certified Pest Control Advisor (PCA) be obtained first and that the herbicide be applied by a licensed or trained applicator.

A less commonly used vegetation control method is grazing, which utilizes grazing animals such as cattle, sheep, or goats to consume and control unwanted vegetation. The successfulness of this treatment method depends on both the species of invasive plant and grazing animal selected, duration, number of animals used per acre, and intensity of grazing. Grazing animals may not always be selective so desirable plants may require additional protection to prevent being grazed on. Grazing activities may also lead to other unintentional environmental impacts such as erosion, soil compaction, and impacts to water quality through introduction of coliform to

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[57] K.G. Beck. 2013. *Economics of Invasive Weed Control: Chemical, Manual/Physical/Fire, Biological, and Doing Nothing*. Invasive Plant Management Technical Webinar Series. Available: http://www.weedcenter.org/technicalwebinars/resources.html.

nearby surface waters via droppings. Invasive plant infestations may also increase as a result of grazing. Overgrazing may promote recolonization of invasive plants and weed seeds or propagules may be transported by livestock from infested areas to non-infested areas. Less than 30 percent of land managers say they frequently use grazing. [56]

Prescribed burning is the intentional use of fire to control unwanted vegetation, recycle nutrients, promote the growth of desirable plant species, and remove potential fire hazard vegetation in a controlled manner. It is a cost-effective technique that can be an excellent tool for decreasing populations of certain invasive weeds, especially for control of annual grasses and forbs such as medusahead, and yellow starthistle. [57] Prescribed burning affects whole plant communities and requires strategies that consider both the effects on invasive plant populations and all plant species as a community. Fire may destroy seedbanks of particular species, or it may trigger the germination of others. With careful control and management, it can be used to deliberately stimulate the growth of desirable species or to prevent the growth of others. Despite its significant potential for effective weed control, stringent air quality protection measures and fire safety concerns make implementing prescribed burnings challenging. Special permits are required and burning may only be conducted under specific weather conditions. Due to these significant hurdles and safety concerns, prescribed burning is used less frequently than other methods. [56]

Biological control, also referred to as biocontrol, is the use of an invasive plant's natural enemies for control. Unlike other control methods, however, biocontrol does not eradicate an invasive plant but instead is aimed at sufficiently suppressing an invasive plant population while maintaining a stable population of the biocontrol species. It is a complex, long-term, and self-sustaining treatment method for managing invasive plants. Use of biocontrol agents is regulated by the U.S. Department of Agriculture (USDA), which conducts extensive tests to judge the effectiveness of biocontrol agents, such as insects and pathogens and evaluates potential non-target impacts. Once a biocontrol agent has passed all tests, a process which can take years, it may be released for control of invasive plants. Numerous successful cases of biocontrol exist, however success has largely been inconsistent in space and time. [58] Biological control failure may occur due to a number of factors including habitat preference by the biocontrol, failure to establish a significant biocontrol agent population, or insufficient ability of the biocontrol agent to sufficiently control the targeted invasive plant population. [59] There is also the risk that biocontrol agents may harm non-target hosts, counteracting the environmental value of reducing density of the weed. Given the complexity of biocontrol, land managers must carefully research choices to promote efficacy and reduce risk of environmental impact. Less than ten percent of land managers report using biological control. [56]

The MCOSD also uses other methods of vegetation control such as:

- Smothering, which is using mulch, black plastic, carpet, or any other impenetrable barrier to cover target plants for at least one growing season. The effectiveness of this technique can be increased by first cutting the target plants and then smothering them.

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[58] J.M. DiTomaso, G.B. Kyser, S.R. Oneto, R.G. Wilson, S.B. Orloff, L.W. Anderson, S.D. Wright, J.A. Roncoroni, T.L. Miller, T.S. Prather, C. Ransom, K.G. Beck, C.A. Duncan, K.A. Wilson, and J.J. Mann. 2013. *Weed Control in Natural Areas in the Western United States*. Berkeley, CA: Weed Research and Information Center, University of California. 544 pp.

[59] J.H. Myers. 1999. What Can We Learn From Biological Control Failures? Proceedings of the X International Symposium on Biological Control of Weeds – July 4-14. Montana State University, Bozeman, Montana, USA. Available: http://www.invasive.org/publications/xsymposium/proceed/02pg151.pdf.

- Blanching/steaming, which uses heat and moisture to control weeds at an early growth stage.
- Solarization, which uses plastic to cover an area and use the heat generated from the sun is a method that has a number of challenges in our cool coastal climate and has limited success with a narrow set of species.

The MCOSD's IPM approach is designed to meet the VBMP objectives described above, which includes maintaining natural vegetation biodiversity within the preserve, maintaining patrol, emergency, and public access, and management of fuel loads to reduce the threat from fire, while preventing adverse effects on human health or the environment. Along with efficacy, cost, and potential for environmental and human and ecological health impacts is always considered when selecting the appropriate invasive plant control method(s). Human and ecological health impacts are high priority considerations, and the potential for harmful effects to human and ecological health are minimized. In addition, the risk to non-target plants, wildlife, aquatic resources, air quality, and other sensitive environmental resources is considered when selecting an appropriate invasive plant management method(s). Implementation of the best management practices presented in the draft VBMP, and incorporation of mitigation measures recommended in the Draft TPEIR would further minimize the potential for implementation of the VBMP to adversely affect human or ecological health or the environment by selecting the most appropriate invasive plant control method(s).

No Herbicide Alternative

Successful management of invasive plants using IPM by MCOSD requires that land managers consider a variety of treatments, including the use of herbicides. As discussed in Chapter 3 of the draft VBMP, the agencies interviewed by the MCOSD expressed that the key to successful control is having the flexibility to select and adapt many treatment methods to a site-specific situation. The IPM process enables flexible decision making and requires agencies to carefully consider and balance the multiple objectives of protecting biological diversity, reducing fire risk, protecting and restoring native plant communities and special status species, and ensuring environmental and human health and safety. According to the California Invasive Plant Council (Cal-IPC), "herbicides are an important tool in the IPM toolbox for controlling wildland weeds". [60] As part of a proper IPM approach, herbicides cannot be excluded.

In some cases, herbicides may be the preferred, environmentally superior alternative. In other situations, other alternatives, such as grazing or prescribed burning, may be more appropriate. In virtually all cases, multiple tools will be integrated together to achieve invasive plant management and the VBMP's goals. Each control method has advantages and disadvantages, and each method has the potential for undesirable impacts and non-target effects. For each control method, there are situations where it is appropriate to use and others where it is not. Removal of any one tool categorically from the IPM tool kit will inhibit effectiveness of implementation of the VBMP and would be environmentally irresponsible as it would reduce the MCOSD's ability to adapt to changing site and environmental conditions and select the least harmful method for a given circumstance. For these reasons, a No Herbicide Alternative would not meet the goals and objectives of the VBMP.

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[60] California Invasive Plant Council (Cal-IPC). 2016. Herbicide BMPs. Available: http://www.cal-ipc.org/ip/management/BMPs/ (Accessed: April 15, 2016).

Decision Making Process

The decision-making process on which control methods would be used to control a population is developed by a technical advisory panel (TAP) that includes a variety to professional and technical experts such as: botanists, vegetation and fire ecologists, wildlife biologists, IPM specialists, etc. using IPM techniques. Consistent with IPM methodology, once positive identification of the target plant is made and the acceptable threshold for the number and location of the plant has been exceeded, the TAP determines which vegetation management technique(s) are most appropriate in a given circumstance to control the vegetation. Further refinement, if necessary, regarding combinations and timing of control techniques are made based on scientific and peer-reviewed literature, state and local best management practice manuals, and other California Invasive Plant council guidelines. In cases where herbicides are being considered as part of the vegetation control approach, a Pest Control Advisor (PCA) licensed by the California Department of Pesticide regulation (CDPR) produces a legally binding written recommendation that states what, how much, where, when, and under what conditions herbicide can be used for the project.

The PCA is at a minimum a four-year degreed professional that has qualified for and passed examinations that demonstrate expertise in invasive plant management. To maintain currency, the PCA must complete no less than 40 hours of continuing education every two years. It is mandatory that laws and regulations are reviewed and this includes compliance with label directions.

The PCA performs a variety of site-specific duties that include site reconnaissance to properly identify plant species, gain an understanding of the degree of control needed, and determine environmentally sensitive areas. For example, the PCA has the authority and responsibility to prepare a written recommendation for the use of the most appropriate herbicide. Among the factors the PCA considers include the timing and method of application of an herbicide relative to weather and plant growth stage, nearby sensitive species, runoff, drift, and impacts to surface and groundwater.

The expertise and credentials of the TAP and PCA use technical and professional judgment in deciding which vegetation management techniques are most appropriate in a given circumstance. For example, using principles of IPM, the TAP or PCA may elect to use some combination of mechanical (flail mower) and biological (goat) controls to supplement targeted use of herbicides. This illustrates that the selection of the appropriate vegetation management tool(s) are dependent on a variety of factors including ease of use, cost, intrusiveness, and environmental impact.

Determination that No Herbicide Use Alternative as Infeasible

Several commentors argued that a No Herbicide Alternative would avoid significant effects to biological resources and risk of hazards. However, the MCOSD cannot make such a conclusion based on the level of detail and information included in the draft VBMP or its TPEIR. As described above, the draft VBMP is a high-level comprehensive plan that does not identify any projects, project sites, or specific treatment methods. Rather it relies on the MCOSD using an IPM approach to identify the most effective least harmful method for a given project. Without herbicides, the MCOSD would have to rely on other techniques such as manual and mechanical removal, tarping, or grazing. All of these methods have the potential to have significant effects on the environment. For example, mechanical removal can increase erosion potential, disturb habitats, and increase air pollution; or tarping could damage wildlife or degrade aesthetics of an area. Additionally, the lack of herbicides could result in significant impacts to the risk of fire hazards by increasing the likelihood that the MCOSD would not be able to maintain its fuel management areas; or it could result in significant impacts to native vegetation, wildlife, or habitats because the MCOSD could not effectively manage invasive plants in the area. Therefore, it is not clear that a No Herbicide Alternative would be less damaging than the proposed project.

In order to make such a determination, the MCOSD requires site-specific information on soils, vegetation, presence of special-status species, weather, proximity to sensitive receptors, and other details to determine the least environmentally damaging method of treatment for any sites that would be managed under the VBMP. The VBMP does not have the level of detail necessary for the MCOSD to make such a determination. Although the draft VBMP describes some of the treatment methods currently used by the MCOSD and other public land management agencies, it does not include a prescription for various treatment options or recommendations in a given situation. As described above, the VBMP is a high-level comprehensive plan and its TPEIR considers its impacts based on the level of detail of the plan.

The VBMP would provide a structure for the District to set priorities and make decisions about future vegetation management projects. Once the MCOSD identifies specific projects using this plan, it will evaluate physical, biological, and other features and constraints for each proposed project. This information will allow the MCOSD to use its IPM approach to determine the most effective least environmentally harmful technique to treating vegetation. With this information, the MCOSD will be able to consider its treatment options, including whether or not to use herbicides on a project-by-project basis. Without this site and project-specific data, the District cannot determine the potential significance of the risk to human health and the environment from the use of herbicides, or compare it to the impacts from the use of an alternative treatment method. Additionally, the TPEIR for the VBMP will not absolve the MCOSD's requirement to comply with CEQA for the specific project. Rather, the District will use the tiering process described in CEQA to evaluate the potential effects of these projects. [61]

In conclusion, the No Herbicide Alternative would not further any of the basic objectives described in the VBMP, in that it would not provide a science-based technique for vegetation management, coordinate all aspects of vegetation management, or provide the foundation for a systematic approach to priority setting, budgeting, and staffing. Additionally, there may be other significant environmental effects from a No Herbicide Alternative. Finally, as a program EIR, it anticipates future CEQA review of specific projects during implementation. During that phase, the MCOSD will consider the impacts from the various treatment methods.

Furthermore, since the objectives of the VBMP are to provide the MCOSD with a systematic, comprehensive, and scientific system for vegetation management, any alternative that it evaluates must achieve these basic objectives. Consideration of a No Herbicide Alternative is out of scale with the objectives of the draft VBMP. The purpose of the VBMP is to develop a structure to make the MCOSD's vegetation management program more efficient and effective. Whether or not the District uses herbicides has no bearing on creating such a systematic approach. The MCOSD's decisions to use herbicides or other vegetation management tools will occur after it reorganizes its vegetation management program. Therefore, a No Herbicide Alternative would not further the MCOSD's objective of creating a strategic plan to implement its vegetation management program.

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[61] See Subsequent Implementation Activities on page 76 of the Draft TPEIR for a further discussion of the tiering process.

MASTER RESPONSE 4 – ADJUVANTS AND INERT INGREDIENTS

ISSUES

Several commentors expressed concern over the potential human health and ecological effects of adjuvants (surfactants) and inert ingredients, requesting that all chemical constituents be identified and their risk analyzed. Additionally, commentors requested that the combined or cumulative risk of active and inert ingredients as well as adjuvants be evaluated.

RESPONSE

In the sections below, the major topics of concern in detail regarding disclosure and evaluation of risk for adjuvants and inert ingredients are discussed.

Adjuvants

Adjuvants is a general term for a variety of materials that are added to an herbicide solution that enhances its performance. Adjuvants may be standalone products that are added to a spray tank with water and the herbicide or may be part of the herbicide formulation produced by the manufacturer. Adjuvants include materials that perform a variety of functions, including, but not limited to aiding in water conditioning and pH stabilization in order keep herbicides dissolved in solution; enhancing the penetration of a herbicide into the plant's waxy cuticle layer in order to increase efficacy and limit the amount of herbicide needed; controlling drift to limit the amount of herbicide that may travel with the air to non-target locations; decreasing the surface tension of a herbicide mixture to allow for better deposition and coverage on the plant surface.

Surfactants are a type of adjuvant and designed to enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of an herbicide.[62] When water droplets containing surfactant contact a plant, they spread into a thin layer over the leaf surface, increasing surface area contact allowing herbicides to more readily penetrate waxy leaf cuticles. Surfactants also aid in controlling spray drift by decreasing surface tension, reducing the formation of small or fine droplets, which are more easily carried by the wind.

The primary surfactants considered for use by the MCOSD are Competitor® and Liberate®. Both are chosen for their low aquatic toxicity and are labeled for use in or near aquatic environments.

Competitor® is a non-ionic, vegetable oil surfactant composed of ethyl and methyl esters of canola oil. The U.S. Food and Drug Administration (USFDA) considers methyl and ethyl esters of fatty acids produced from fats and oils, such as canola oil, to be food grade additives.[63] Specific ingredients listed on the label include ethyl oleate (a regulated food additive under 21

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[62] D. Bakke. 2007. *Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides*. Unpublished report by the Forest Service Pacific Southwest Regional Pesticide Use Specialist. Available: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_045552.pdf.

[63] U.S. Food and Drug Administration (USFDA). 2015- 172.225 – CFR – Code and Federal Regulations Title 21. Available: https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=172.225.

CFR 172.515), sorbitan alkylethoxylate ester, and dialkyl polxyethylene glycol. [64] Competitor® is designed and registered for use in aquatic environments (i.e., approved for aquatic use) and contains an alkyl ethoxylate ester. Competitor® does not contain nonylphenol polyethoxylate (NPE), which may under certain circumstances pose a risk to aquatic receptors. [65] Furthermore, polyethoxylated tallow amine (POEA) is not listed as an ingredient on the product label or Safety Data Sheet (SDS).

Liberate® is a non-ionic surfactant registered for aquatic use and composed of lecithin, methyl esters of fatty acids, and alcohol ethoxylates. Lecithins are naturally occurring phospholipids that are ubiquitous in biological cell membranes. Lecithins, like methyl and ethyl esters of fatty acids, have very low toxicity and have been approved by the USFDA as a food additives with the status of "generally recognized as safe (GRAS)" for human consumption. [62,66] Liberate® is designed and registered for use in aquatic environments (i.e., approved for aquatic use) and neither NPE nor POEA are listed as ingredients on the product label or SDS.

Pentra-Bark® may also be utilized by the District for basal bark applications. Pentra-Bark® is a non-ionic organosilicone wetting agent that enhances herbicide penetration through bark. It contains alkylphenol ethoxylate, polysiloxane polyether copolymer, and propylene glycol. Neither NPE nor POEA are listed on the product label or the SDS.

The United States Forest Service (USFS) conducted a thorough review how surfactants may affect the absorption rate of herbicides through skin. [62] Based on the available literature, the USFS concluded that, for a surfactant to increase the absorption of another compound, such as an herbicide, the surfactant must affect the upper layer of the skin and conclude that without some physical effect to the skin, there is no change in absorption as compared to the other compound alone. Further review of the literature also indicated that non-ionic surfactants, which includes as Competitor®, Liberate®, and Pentra-Bark®, have less of an effect on the skin, and hence absorption, than cationic or anionic surfactants. Studies also appeared to indicate that alkylphenol ethoxylates, an ingredient found in Pentra-Bark®, generally have little to no effect on absorption of other compounds. Lastly, in contrast to expectation, the USFS found that several studies indicated that the addition of surfactants actually decreased the absorption to skin. [62]

The weight of the available evidence indicates that there is little support for the contention that the addition of surfactants to herbicide mixtures increases the absorption of herbicides through the skin. Therefore, the effects of increased absorption of herbicide active ingredients due to the addition of surfactants to herbicide mixture is not necessary to further evaluate in this environmental document and no revisions to the draft TPEIR are required.

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[64] U.S. Food and Drug Administration (USFDA). 2015. 172.515 - CFR - Code and Federal Regulations Title 21. Available: https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=172.515 (Accessed: April 21, 2016).

[65] USDA Forest Service. 2003. *Human and Ecological Risk Assessment of Nonylphenol Polyethoxylate-based (NPE) Surfactants in Forest Service Herbicide Applications*. Unpublished Report, written by David Bakke, Pacific Southwest Region Pesticide-Use Specialist. May 2003, 182 pp. Available: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5346866.pdf.

[66] U.S. Food and Drug Administration (USFDA). 2015. *Select Committee on GRAS Substances (SCOGS) Opinion: Lecithin*. Available: http://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/SCOGS/ucm260453.htm (Accessed: May 6, 2016).

If exposure of adjuvants to users of the MCOSD were to occur, it would be by either aerial drift or by contact with a plant surface. Neither of these routes of exposure are expected to occur for several reasons. First, the methods of application used by MCOSD staff minimize or eliminate drift by using low volume and/or low pressure application equipment with nozzles placed in close proximity to the target plant, resulting in a highly targeted application. Second, consistent with herbicide label instructions and the standard of care utilized by the QAL or QAC, applications are not made when weather conditions are unfavorable and may result in drift. Third, vegetation that is treated with an herbicide will have signage indicating treatment and that entry into the area were treated vegetation exists is prohibited until expiration of the re-entry interval (REI) specified on the herbicide label. Once the REI has expired, herbicide and adjuvant on the plant is dry and therefore unlikely to be available to transfer to a preserve user. Fourth, in regard to Pentra-Bark®, this adjuvant is used with an herbicide and is applied via basal bark application. This type of application uses a minimal amount of material and the introduction of the material onto the plant is highly targeted, essentially eliminating the risk of significant drift or non-target exposure.

Because of the lack of exposure of preserve users to adjuvants, no unacceptable risk to human health is expected. No revisions to the draft TPEIR are necessary.

Inert Ingredients

Inert ingredients, which includes adjuvants, are any ingredients added to an herbicide formulation to enhance the effectiveness of the herbicide or improve product performance. Example functions of inert ingredients in herbicides include:

- Improving safety to the applicator
- Acting as a solvent to improve active ingredient penetrance into plants
- Extending product shelf-life
- Preventing herbicide degradation via sunlight exposure

Under federal law, the identity of inert ingredients is often considered confidential business information and manufacturers are not required to identify inert ingredients by name or percentage on product labels. However, before an inert ingredient may be included in an herbicide, they must first be disclosed to and approved by the USEPA.[67] In their approval process, the USEPA reviews safety information for each inert ingredient before approval. This process involves the consideration of risk following exposure to the inert ingredient based on typical or expected use of the product.

In general, risk assessments focus on the herbicide active ingredient, although in some cases it may consider herbicide formulations and inert ingredients, including adjuvants, when sufficient data are available. For numerous herbicide products containing inert ingredients as part of the formulation, the compounds and their percent composition within the product are not explicitly or sufficiently identified on the label or Safety Data Sheet (SDS). Additionally, risk evaluations may only be conducted for chemicals for which toxicity data as well as physical, chemical, and environmental fate properties are available. Without more detailed information, it is not possible to conduct a risk evaluation on inert ingredients. Therefore, inert ingredients were not included in the risk screening, which instead focused on herbicide active ingredients.

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[67] U.S. Environmental Protection Agency (USEPA). *Basic Information About Pesticide Ingredients*. Available: https://www.epa.gov/ingredients-used-pesticide-products/basic-information-about-pesticide-ingredients.

Cumulative Risk

As inert ingredients could not be included in the risk screening process as described in the previous section, a cumulative risk evaluation for both active and inert ingredients could not be evaluated.

Unlisted or Trade Secret Ingredients

Typically, the U.S. EPA requires listing only active ingredients on labels. In some cases, ingredients may be unlisted because they are considered proprietary “trade secret” ingredients. In other cases, inert ingredients may be named, but the percent composition is not clearly specified. Although the details of these ingredients are not available to the public, they are disclosed to and evaluated by the U.S. EPA. Any unlisted or trade secret ingredients contained within registered adjuvant formulations have been evaluated by the U.S. EPA as safe when used according to label or the U.S. EPA found no evidence indicating that the ingredients posed a hazard to humans or the environment. Without additional information on the identity and/or percent composition of unlisted or proprietary ingredients, their risk cannot be evaluated.

MASTER RESPONSE 5 – HERBICIDE USE

ISSUES

Some commentors have expressed concern over the use of herbicides and their safety. Among the primary concerns voiced is that herbicide labels may be incorrect and misleading, leading to hazards and impacts related to routine transport, use, or disposal of herbicide materials. Others express concern over the use of particular methods of application, in particular cut stump applications, and the disclosure of products that may be used by the District.

RESPONSE

In the sections below, the major topics of concern are addressed in detail regarding the use of herbicides and their safety.

Herbicide Regulations, Labels, and Safety

Numerous regulations, policies, and practices govern the use of herbicides. These regulatory mechanisms are an important part of ensuring safe use of herbicides and the protection of human health and the environment.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) mandates the USEPA to regulate the use and sale of herbicides to protect human health and the environment. This mandate is achieved by the USEPA through the registration and labeling of herbicides. Under FIFRA, all new herbicides must be registered or exempted by the Administrator of the USEPA, a process in which the appropriate environmental settings and treatment sites for the herbicide is to be used are identified and prescribed based on research data. In order to ensure that registrations are up to date and that any new research data are incorporated, all registrations must be reviewed on a 15 year cycle, and all herbicides registered before 1984 must be reregistered for use. Labeling requirements control when, where, and under what conditions an herbicide may be applied, mixed, stored, loaded, or used, and when a treated site may be reentered after application.

At the state level under the California Food and Agricultural Code (CFAC), the California Department of Pesticide Regulation (CDPR) has the authority and responsibility to register herbicides for use and sale within California. Before CDPR may register an herbicide for use in California, the herbicide must first be registered for use by the USEPA. Additionally, CDPR performs human health and environmental risk assessments of herbicides before allowing them to be sold or used in California, and it periodically re-evaluates already registered herbicides.

When an herbicide is evaluated for registration, USEPA and CDPR consider the chemical characteristics of the active ingredient(s) and potential exposure to both humans and environmental receptors during herbicide applications. Potential effects are considered to human health, water quality, aquatic environments, and non-target ecological receptors. Potential incompatibilities with other chemicals are also considered in the process. From this evaluation, these agencies add restrictions to the herbicide product label to prohibit the use of the herbicide from occurring in a manner that has the potential to produce adverse effects. Label restrictions may specify where and when an herbicide may or may not be applied, the maximum rate of application, the time interval during which additional applications of the herbicide may or may not be made, or incompatible chemicals that must be avoided.

CDPR considers the toxic properties of herbicide ingredients and estimates the amount of the ingredient that could potentially cause an adverse effect. This includes acute (one-time), subchronic (one to three months), and chronic (long-term and lifetime) evaluations. Compared to the USEPA's review, CDPR's review of an herbicide focuses on California-specific potential impacts and may require additional studies, such as data on worker exposure, foliar residue, indoor exposure potential, hazards to pollinators such as bees, dust hazards, and efficacy.

All herbicides used by the MCOSD are registered for use by the USEPA and CDPR. For applications in or near water, only herbicides that have been approved for this particular use are used.

MCOSD employs certified and trained applicators. Specifically, prior to an herbicide application, a Pest Control Advisor (PCA) licensed by the California Department of Pesticide Regulation (CDPR) is involved. The PCA is at a minimum a four-year degreed professional that has qualified for and passed examinations that demonstrate expertise in invasive plant management. To maintain currency, the PCA must complete no less than 40 hours of continuing education every two years. It is mandatory that laws and regulations are reviewed and this includes compliance with label directions.

The PCA performs a variety of site-specific duties that include site reconnaissance to properly identify plant species, gain an understanding of the degree of control needed, and determine environmentally sensitive areas. For example, the PCA has the authority and responsibility to then prepare a written recommendation for the use of the most appropriate herbicide. Among the factors the PCA considers include the timing and method of application of an herbicide relative to weather and plant growth stage, nearby sensitive species, runoff, drift, and impacts to surface and groundwater.

In addition to following the recommendations of a trained and credited PCA, all applications by the MCOSD would be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAL) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years to maintain currency and are trained in techniques to minimize impacts to human health or the environment. Where appropriate, the QAL/QAC holders may recommend additional protective measures beyond what is required by the label.

MCOSD will continue to implement best management practices (BMPs) as presented in the California Invasive Plant Council (Cal-IPC) recently published guide Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management.[68] [69] These BMPs include, but are not limited to the use of adjuvants to reduce spray drift, adding marker dye to herbicide mixtures to aid in preventing drift or mis-application to non-target plants, use of tools such as brush hooks to concentrate target foliage as to move it away from non-target plants and reduce overspray, flagging native plants and/or plants to be treated if feasible, the use of aquatic approved formulation of herbicides and low-toxicity surfactants when working in areas where sensitive aquatic resources may be present, use of low-pressure and large droplet nozzles to reduce spray drift, and use of highly targeted application methods (e.g., spot treatments, backpack sprayer, cut stump, etc.) where appropriate to significantly reduce the amount of pesticide transported to water via drift, runoff, and erosion. These measures would further minimize potential impacts beyond the protection afforded by following herbicide label requirements.

The numerous regulations, policies, and practices that govern the use of herbicides, which includes following the label, are designed to be protective of human health and the environment. With implementation of the BMPs presented in the draft VBMP, and incorporation of mitigation measures contained in the Draft TPEIR further minimize the potential for implementation of the VBMP to adversely affect human or ecological health or the environment. With implementation of the VBMP, the BMPs presented in the draft VBMP, and incorporation of the mitigation measures in the Draft TPEIR, the risk to human health and the environment would be less-than-significant

Substantially Similar Products

Under certain application conditions, multiple herbicide products may be considered substantially similar to one another such that the risk results generated for a particular product and scenario are applicable to the use of other substantially similar products. USEPA defines "substantially similar" as:

> *"substantially similar" or "identical" in composition and labeling to other USEPA-registered herbicide products or would differ in ways that would not significantly increase the risk of unreasonable adverse effects on the environment.*[70]

Substantially similar products are products that are considered sufficiently similar in composition and methods of application such that the risk results generated for one product are considered equally relevant to the use of any other product sharing one or more substantially similar features. As discussed in the Draft TPEIR, substantial similarity between two products may be concluded based on one or more of the following features:

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[68] California Invasive Plant Council (Cal-IPC). 2016. *Herbicide BMPs*. Available: http://www.cal-ipc.org/ip/management/BMPs/ (Accessed: April 15, 2016).

[69] Email from Pete Frye, MCOSD to David Bonnar, Blankinship and Associates, April 11, 2016.

[70] U.S. Environmental Protection Agency (USEPA). 2016. *Pesticide Registration Manual: Chapter 2 – Registering a Pesticide Product. Office of Pesticide Programs*. USEPA. Available: https://www.epa.gov/pesticide-registration/pesticide-registration-manual-chapter-2-registering-pesticide-product.

- Similar product formulation including similar or identical active and inert ingredients and percent composition thereof
- Similarities in the methods of application, including equipment, rates, location, and timing
- Similarities in use or lack of use of adjuvants

As herbicide products frequently change names, fall off patent, and enter the market, a list of substantially similar products is not presented here. However, in the event the MCOSD staff wishes the use of an herbicide product not considered directly in the analysis, staff may evaluate whether it qualifies as a substantially similar product based on the criteria previously presented. Conditions in which a new product would not be considered substantially similar are any changes to the product or its use that may affect the risk associated with its use. These changes include, but are not limited to:

- An increase in the maximum use rate over the previous product
- The inclusion of an adjuvant in the new formulation
- Significant changes in method of application, equipment, location, or timing allowed by the label

With implementation of the VBMP, the BMP presented in the VBMP, and incorporation of the mitigation measures in the Draft TPEIR, the risk to human health and the environment would be less-than-significant for all herbicides evaluated and any substantially similar products.

Cut Stump Applications

Cut stump applications are highly targeted applications where herbicide is applied with a paint-brush, wick applicator, or low volume sprayer to the stump of a cut down tree. Concentrated herbicide is used in these treatments; however, the volume applied is extremely low and virtually all of the herbicide is applied directly to the target stump where it is absorbed into the plant's vascular system. The highly targeted nature of cut stump applications renders it an environmentally safe method as off-site movement from the targeted tree is highly unlikely.

Postings and Signage

For all herbicide applications, the MCOSD would implement **BMP-Invasive-Plant-1** *Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage procedures*, which requires that all applications must be posted with the current "*Notice of Herbicide Application*" both four days in advance of and four days after an application at all main entry points. Additionally, for all proposed treatment areas, application notices will be accompanied by a map of the site indicating the approved area to be sprayed. These *Notices of Herbicide Application* are designed to inform preserve users and prohibit entry to areas where preserve users may come into contact with herbicide residues on foliage before the herbicide has had an opportunity to be absorbed, degrade or dry.

In some cases, herbicide labels may impose a restricted entry interval (REI), which is the period of time after a site is treated with an herbicide during which restrictions on entry are in effect. These restrictions are established to limit the exposure of herbicide residues to workers or other persons not involved in the application of an herbicide, such as park users.

The duration with which an REI is in effect is determined by both the degradation rate of the herbicide as well as the amount of dislodgeable foliar residue (DFR) present after a given period of time. DFR is the amount of herbicide residue that can transferred to people coming into contact with the treated foliage. After an herbicide is applied, it begins to dry, reducing the amount of DFR available. After the REI has passed, the herbicide will have either significantly degraded and/or the DFR will have been reduced sufficiently such that the herbicide does not pose a hazard to people coming into contact with the treated foliage.

None of the herbicides proposed for use by the District have REIs greater than four days. Thus, the amount of herbicide available as DFR when the *Notice of Herbicide Application* signs are removed is anticipated to be below the level of concern and does not pose a hazard to park users.

Product Disclosure

The labels and SDS for all herbicides proposed for use by the MCOSD are available in the Technical Appendix.[71]

MASTER RESPONSE 6 – IMPACT EVALUATION

ISSUES

Some commentors have expressed concern with the evaluation of impacts in the Draft TPEIR. Among those concerns are the potential cumulative impacts due to exposure to multiple herbicide ingredients, the effects of multiple herbicide treatments within the District, and the cumulative impacts of agencies outside the District treating their respective properties with herbicides. Others were concerned with potential endocrine disrupting and synergistic effects.

RESPONSE

In the sections below, these topics of concern are addressed in detail regarding potential impacts of herbicide use.

Cumulative Impacts

Cumulative impacts refer to two or more individual effects that, when considered together, are considerable, compound, or increase other environmental impacts. The potential cumulative impacts due to past, present, and future herbicide use by MCOSD and other agencies located near the open space lands is discussed in **Chapter 5.5 – Hazards – Herbicide Use** (pages 243-250) and **Chapter 7 – Impact Overview** (pages 352-372) of the Draft TPEIR. Chapter 5 discusses past, present, and future herbicide use in or near the District and their low likelihood to contribute to cumulative impacts. Chapter 7 discusses how herbicide degradation, the localized nature of herbicide applications, and the low toxicity of herbicides to animals and humans all reduce the likelihood of cumulative impacts to a less-than-significant impact. An assessment of cumulative impacts due to the inclusion of inert ingredients and adjuvants is discussed in **Master Response 4 – Adjuvants and Inert Ingredients**. Due to the lack of

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[71] The Technical Appendix is available for review at the Marin County Open Space District, 3501 Civic Center Drive, Suite 260, San Rafael.

information available regarding the public use of herbicides, there is no ability to analyze the contribution of the public, if any, to the herbicide use by the MCOSD or other agencies.

Spray Drift and Volatilization

When any sprayed substance is used, it is possible that minute quantities of mist, drip, drift, or splash of product onto non-target vegetation may occur. This process is known as aerial drift and is a factor to consider when evaluating the fate of herbicides, as spray droplets could theoretically drift off-target during application. To further minimize the effects of spray drift, the MCOSD will continue to implement drift control BMPs as presented in the California Invasive Plant Council (Cal-IPC) recently published guide *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*.[72] These BMPs include, but are not limited to, the use of adjuvants to reduce spray drift, low-pressure and large droplet nozzles, using pulsed application techniques where applicable, and using more targeted application methods (e.g., spot treatments, backpack sprayers, cut stump, etc.) where appropriate. Additionally, all applications will be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years to maintain currency and are trained in the techniques to minimize drift, such as proper selection of nozzle and pressure. Additionally, none of the proposed herbicides are volatile and exposure through volatilized product is minimal or does not occur. The combination of following herbicide label directions, implementing the appropriate BMPs, the low volatility of proposed herbicides, and applying under the guidance of a well-trained QAL/QAC, the potential impact due to drift and volatilization of herbicides is insignificant.

Endocrine Disruption

Although endocrine disruptors are generally considered to have the potential to cause adverse effects, considerable uncertainty exists regarding the relationship between endocrine disruptor exposure and adverse health outcomes. In many cases, only screening level data are available to indicate the potential for a chemical to interact with the endocrine system in a way that may produce an adverse effect.[73] In general, these and other forms of endocrine disruptor data are not sufficient for conducting a risk assessment. As a result, there is insufficient information to assess the risk due to endocrine disruption in the TPEIR.

Synergism

MCOSD acknowledges that synergism and other combination interactions exist (including negative combinations due to mechanism overload); however, there is a lack of studies evaluating combinations of chemicals in order to determine effect. This is a known and accepted limitation of the risk assessment process. However, for purposes of making risk management decisions, and given the safety and uncertainty factors involved, this is acceptable for informing agencies on how to proceed with a policy decision regarding risk given the degree of uncertainty always exists.

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[72] Email from Pete Frye, MCOSD to David Bonnar, Blankinship and Associates, April 11, 2016.

[73] U.S. Environmental Protection Agency (USEPA). 2011v. *Endocrine Disruptor Screening Program (EDSP) Overview. Office of Chemical Safety and Pollution Prevention*. Available https://www.epa.gov/endocrine-disruption/endocrine-disruptor-screening-program-edsp-overview (Accessed: June 13, 2016).

MASTER RESPONSE 7 - HYDROLOGY AND WATER QUALITY

ISSUES

This Master Response was prepared to address comments related to *Impact 5.2-1 Water Quality Standards or Waste Discharge Requirements* and *Impact 5.2-3 Degraded Water Quality and Substantial Additional Sources of Polluted Runoff*. In particular, numerous comments questioned the partial reliance of the associated mitigation measures on implementation of Mitigation Measure 5.1-1, which provided detailed protocols for a treatment program initially prescribed under **BMP- Sensitive Natural Resources-1** of the draft VBMP that MCOSD would follow when considering herbicide treatments within the 100 ft. buffer setback for sensitive resources. Questions were raised as to the degree of specificity and the adequacy of the protocols outlined in Mitigation Measure 5.5-1 in protecting water quality. In addition, concerns were voiced regarding the application of specific herbicide formulations, especially within the 100 foot buffer, and the water quality risk posed by the transport of herbicide residues in surface runoff to receiving streams, ponds, or other sensitive waterbodies.

RESPONSE

As discussed in the Draft TPEIR, the MCOSD would implement Mitigation Measure 5.2-1 to address potential impacts to water quality. With implementation of Mitigation Measure 5.2-1, BMPs shall be adopted that include A) using only herbicides approved for aquatic and near water environs use when treating within 100 feet of any waterbody, including wetlands, B) prohibiting the mixing or loading of herbicides within 100 feet of any waterbody, including wetlands, C) the immediate remediation of accidental spills of herbicides, which includes initial containment followed by removal using absorbent materials and excavation and removal and proper disposal of surface soils from the spill area, , and D) restricting herbicide application to 24-hour window with a less than 50 percent chance of rain. Together, these BMPs significantly reduce or prevent entirely the transport of herbicides from the site of application to water through runoff, erosion, or spray drift.

In most cases, herbicides are not applied during the rainy season (October 15 - April 15) when rainfall and surface runoff are most likely to occur, and when the risk of transport of herbicide residues to streams is higher. Herbicides are typically applied during the growing season of the target species in spring and early summer, not during the rainy season in Marin County. And the product labels and treatment practices typically call for a 24-hour restriction on application any time rainfall is forecast. In the absence of rainfall, bacterial processes within soil-water environment of the soil profile act to substantially degrade the herbicides before they reach streams or other waterbodies.

With the implementation of Mitigation Measure 5.2-1, the potential project impacts of applied herbicides to water quality are less-than-significant outside of the 100 foot buffer around sensitive natural resources. In cases where herbicide treatment within the minimum 100-foot buffer is considered essential to control invasive species and reduce the threat to sensitive natural resources, MCOSD will implement Mitigation Measure 5.5-1.

Mitigation Measure 5.5-1 requires that, when herbicide treatment within a minimum 100-foot buffer is necessary, the MCOSD will prepare a treatment program, as called for in **BMP-Sensitive Natural Resources-1**. The treatment program recommended in **BMP-Sensitive Natural Resources-1** would evaluate options for treatment and risk to the sensitive natural resource, define a preferred treatment plan, identify controls for avoiding and minimizing potential adverse effects on sensitive natural resource, provide details on any required compensatory mitigation, and include requirements for monitoring. Additionally, Mitigation Measure 5.5-1 revises **BMP-Invasive-Plant 2** to restrict herbicide use to targeted application methods, including, but not limited to foliar spot spray and cut stump applications. Herbicide(s), and application method(s) will be reviewed in the treatment program, and recommendations made for preferred treatment based on site-specific conditions, threats, and benefits to the sensitive natural resources, and latest adaptive management practices. These BMPs dictate that vegetation treatment, fire fuel management, and other activities performed within the buffer area around sensitive natural resources would result in no additional significant impacts on water quality or biological resources.

In order to accomplish biodiversity and invasive plant control objectives, a high degree of professional judgment is exercised by vegetation management experts whose education, background, and experience in IPM and natural resource protection are used to develop customized solutions that are tailored to solving a specific problem. Thus, the degree of applied constraints on herbicide use must be site-specific and weighed against the cost of allowing irreparable spread of invasive plants and a decline in the diversity of native plant and animal communities.

Specifically, prior to the application of an herbicide, a Pest Control Advisor (PCA) licensed by the California Department of Pesticide Regulation (CDPR) is involved. The PCA is at a minimum a four-year degreed professional that has qualified for and passed examinations that demonstrate expertise in invasive plant management. To maintain currency, the PCA must complete no less than 40 hours of continuing education every two years. It is mandatory that laws and regulations are reviewed and this includes compliance with label directions.

The PCA performs a variety of site-specific duties that include site reconnaissance to properly identify plant species, gain an understanding of the degree of control needed, and determine environmentally sensitive areas. For example, the PCA has the authority and responsibility to then prepare a written recommendation for the use of the most appropriate herbicide. Among the factors the PCA considers include the timing and method of application of an herbicide relative to weather and plant growth stage, nearby sensitive species, runoff, drift, and impacts to surface and groundwater.

The expertise and credentials of the PCA allow him or her to exercise professional judgment in deciding which vegetation management techniques are most appropriate in a given circumstance. For example, using principles of IPM, the PCA may elect to use some combination of mechanical (flail mower) and biological (goat) controls to supplement targeted use of herbicides. The selection of the appropriate vegetation management tool(s) are dependent on a variety of factors including ease of use, cost, and intrusiveness and environmental impact. For example, the use of goats may cause erosion, soil compaction, consumption of desirable plant species, and coliform water quality impacts to adjacent surface water.

In addition to following the recommendations of a trained and credited PCA, all applications will be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAL) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years to maintain currency and are trained in techniques to minimize impacts to water quality and aquatic organisms from herbicide use.

The MCOSD has stated that as a general practice, it intends to continue to implement best management practices (BMPs) as presented in the California Invasive Plant Council (Cal-IPC) recently published *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*.[74] [75] Implementation of these BNPs would further reduce impacts to water quality and not-target organisms. Cal-IPC is a well-respected non-profit organization with a mission to protect California's lands and waters from ecologically-damaging invasive plants through science, education and policy. The BMPs in the Cal-IPC manual include, but are not limited to, the use of aquatic approved formulation of herbicides and low-toxicity surfactants when working in areas where sensitive aquatic resources may be present, use of low-pressure and large droplet nozzles to reduce spray drift, and use of highly targeted application methods (e.g., spot treatments, backpack sprayer, cut stump, etc.) that significantly reduce the amount of pesticide transported to water via drift, runoff, and erosion.

Consistent with current practices, the MCOSD staff will continue to implement the best management practices from the 2015 Cal-IPC manual. BMPs in that document that relate directly or indirectly to hydrology and water quality are paraphrased as follows:

BMP GH3-5a Do not apply herbicides when wind speed and direction may cause herbicide drift to open waters or areas of saturated soils. Drift prevention measures should be based on site-specific factors, however, wind speeds < 12 mph do not generally cause substantial drift, especially when low volume or hand-held equipment is used.

BMP GH4-2 Consider using products formulated for aquatic use and adding a low-toxicity surfactant when working in upland areas where amphibians may be present. Be aware of water features, drainage ditches, springs, saturated soils or depressions that may hold water and support wildlife. This includes shallow groundwater recharge zones upgradient of active springs.

BMP GH5-1a&b Limit the amount of herbicide that can be transported in a vehicle (e.g. carry no more than 5 gallons of concentrated herbicide or 100 gallons of diluted herbicide. Transport concentrated herbicides in a spill-proof, non-food container in addition to the container that comes with the product.

BMP GH5-2a-c Herbicide mixing areas should have few native plants or other desirable species; not be susceptible to erosion or runoff; and have easy access for containment and clean-up of spills. Use a basin or other container under the mixing containers to keep spills of the ground in the mixing area. Load spray equipment away from any body of water.

BMP GH5-3 As feasible and appropriate, add a marker dye to the herbicide mixture so workers can readily see any spills, or detect any drift or misapplication to non-target plants, and to monitor where they have sprayed previously.

BMP GH5-6 Designate dry stream crossings for workers in areas where treatments occur on both sides of a flowing or wet stream channel to avoid wash-off of herbicide from applicators' shoes.

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[74] California Invasive Plant Council (Cal-IPC). 2015. *Best Management Practices (BMPs) for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. Available: www.cal-ipc.org.

[75] Email from Pete Frye, MCOSD to David Bonnar, Blankinship and Associates, April 11, 2016.

BMP GH5-7 Do not leave herbicides unattended. Herbicides (either concentrated or diluted) must be stored in locked enclosures or containers when unattended. Triple-rinse emptied herbicide containers into the sprayer at the time of use and utilize these spray rinsates in areas allowed by the herbicide label.

BMP FA2-5 Consider direction of spray. Spraying downward can reduce horizontal drift to non-target plants, applicators or adjoining water environments. A longer wand can be attached to the hose of a spray rig to reach out over dense stands of vegetation and spray downward onto the target plant.

BMP FA2-6 When spraying along a riparian corridor, spray from the direction of the creek towards the bank (inland) to reduce spray into the creek.

BMP SA3-4 When applying herbicide in an aquatic environment, decaying plant material will result in reduced levels of dissolved oxygen needed by fish. Limit the amount of decaying biomass at any one time.

Toxicological data cited in the Cal-IPC document indicate that application of some tested herbicides at half the maximum application rate recommended by the product label may result in Hazard Quotient (HQ) values of near 1.0 or greater, which is the threshold of concern for detrimental impacts on target organisms. This "half-maximum" application rate was used by Cal-IPC to approximate application rates typically used in wildland herbicide treatments. For example, entire acres are very rarely treated when controlling invasive plants. Applications are typically limited to only portions of an acre that are spot treated. Some of the tested herbicides are not used by the MCOSD. These include 2,4-D acid, chlorsulfuron, and glyphosate with the surfactant POEA. Glyphosate without surfactant was tested and was found not to present a substantial risk.

Of the principal active herbicide ingredients potentially applied by land managers in or near aquatic resources, only triclopyr BEE (i.e. Garlon 4 Ultra) exceeded thresholds of concern. Under worst-case assumptions, triclopyr BEE exceeded thresholds of concern for aquatic invertebrates and fish from first-flush runoff. Note that, consistent with its low aquatic toxicity and "aquatic approved" registration status, triclopyr TEA did not exceed thresholds of concern for any aquatic receptors, even under worst-case assumptions.

Consistent with Cal-IPC's conclusions, the risk-screening analysis presented in the Draft TPEIR concluded that use of triclopyr BEE containing products, such as Garlon 4 Ultra, poses the potential for risk and significant impact to aquatic receptors. This significant impact was mitigated in the Draft TPEIR through implementation of Mitigation Measure 5.2-1. Based on the conclusions in the Draft TPEIR and those of Cal-IPC presented above, to reinforce the District's practices and further strengthen the mitigation measures presented in the PEIR, the District will continue to implement the BMPs presented by Cal-IPC in their 2015 Best Management Practices for Wildland Stewardship.

Based upon the above, Mitigation Measure 5.2.1 on page 170 of the Draft TPEIR is revised as follows:

- ***Mitigation Measure 5.2-1*** The MCOSD shall implement the following mitigation measures in order to reduce impacts on water quality standards described in the SF Bay Basin Plan, as amended by the TMDL for Diazinon and Pesticide Related Toxicity in Urban Creeks (2007).
- ***Mitigation Measure 5.2-1(a)*** Implement Mitigation Measure 5.5-1.

- ***Mitigation Measure 5.5-1*** pertains to limits on and prerequisite actions for application of herbicides and other treatment and vegetation management activities within 100 feet of sensitive natural resources.
- ***Mitigation Measure 5.2-1(b)*** In order to reduce impacts on water quality standards described in the SF Bay Basin Plan, as amended by the TMDL for Diazinon and Pesticide Related Toxicity in Urban Creeks (2007), the MCOSD shall adopt the following new best management practices:
  - ***BMP-Hydrology and Water Quality (new)*** Use only herbicides approved for aquatic and near water environs when treating near any waterbody, including wetlands.
  - ***BMP-Hydrology and Water Quality (new)*** Prohibit the mixing or loading of herbicides within 100 feet of any waterbody, including wetlands.
  - ***BMP-Hydrology and Water Quality (new)*** Accidental spills of herbicides should be remediated immediately to minimize the risk of off-site migration in surface runoff or groundwater flow. Remediation should include initial containment, followed by removal using absorbent materials and excavation and removal and proper disposal of surface soils from the spill area.
  - ***BMP-Hydrology and Water Quality (new)*** Restrict herbicide applications to a 24-hour window with a less than 50 percent chance of rain.
  - <u>***BMP-Hydrology and Water Quality (new)*** When applying herbicides in tidal areas, consult with the SFEI's Invasive Spartina Project program staff regarding efficacious methods of treatment to minimize the risk to water quality.</u>
  - <u>***BMP-Hydrology and Water Quality (new)*** If use of Triclopyr BEE is considered the only viable control option for invasive plants within the 100-foot buffer zone for aquatic resources, restrict its application whenever possible to the dry season extending from April 15 to October 15 when the likelihood of stormwater runoff is low. If the targeted invasive plants can only be effectively treated during the rainy season (October 15 to April 15), follow the protocols outlined in Mitigation Measure 5.1-1 and document the overriding considerations in favor of its application.</u>
  - <u>***BMP-Hydrology and Water Quality (new)*** Apply treatments within the 100 feet aquatic buffer area in the upstream direction, i.e. treating downstream sites first and then move to upstream sites thereafter.</u>

Significance After Mitigation - Implementation of Mitigation Measure 5.2-1, in conjunction with Mitigation Measure 5.1-1 would reduce the project impact on currently established water quality standards to a less-than-significant level. Mitigation Measure 5.5-1 would provide an adaptable framework for herbicide use within stream, bay, and wetland setbacks, and would allow for the application of herbicides within such setback areas in accordance with a site-specific treatment program that would consider the presence or suspected presence of sensitive receptors.

The new BMPs addressing water quality impacts would reduce the potential for herbicides and their degradation by-products to migrate through surface waters or groundwater to sensitive waterbodies. The 100 foot buffer would provide for substantial degradation or sequestering of any herbicide or degradation by-products through both soil, plant/litter, and water contact. Herbicides degrade more quickly when in contact with soil, under both overland flow and soil infiltration scenarios.[76] Moreover, herbicide adsorption ~~(i.e. hydrochemical bonding) of these ingredients~~ is enhanced as the clay content increases.[77]

A representative scenario for herbicide migration could involve a small pond that is sustained principally by direct rainfall and groundwater discharge from the surrounding mildly sloping terrain. For a loam or silty sand soil, a representative hydraulic conductivity of 1 x 10-2 cm/sec, a water table depth of one foot and a hydraulic gradient (i.e. slope of the groundwater surface) of two percent, the groundwater flow velocity would be 28 feet/day. This would translate to a travel time of roughly 3.5 days to traverse a 100-foot buffer, including the time for infiltrated rainfall to percolate vertically to the water table. Given the influence of soil adsorption and normal herbicide breakdown in water (hydrolysis), the 100-foot setback would provide significant time for herbicide degradation to occur to protect the pond.

Maintenance of a 100-foot water body setback for herbicide mixing and loading would also reduce the risk that a herbicide spill would migrate an unacceptable distance from the spill site.

Adherence to the provision for a 24-hour window with a less than 50 percent chance of rain condition for herbicide application would provide for substantial natural degradation of the applied herbicide in contact with plant litter, soil and soil water. 78 <u>For example, research on the degradation rate of glyphosate in flowing streams indicates that residue is undetectable after three to 14 days.[79] Faster degradation rates are observed in water with higher suspended sediment concentrations since glyphosate is readily adsorbed to sediment particles. Beginning herbicide treatments at downstream sites and moving upstream to succeeding sites within the same stream system will also maximize the beneficial effects of dilution and hydrolysis (aquatic breakdown of herbicide products) and minimize cumulative water quality impacts.</u>

Responsibility and Monitoring The Marin County Open Space District Board of Directors would be responsible for adopting the best management practices described in Mitigation Measure 5.2-1 as part of the Vegetation and Biodiversity Management Plan.

MCOSD would be responsible for preparing pesticide use reports (PURs) consistent with state regulations. In accordance with the limitation on herbicide applications within a 100 foot waterbody buffer, MCOSD would be responsible for preparing the recommended Treatment Program where sensitive natural resources are present or suspected. It would also be responsible to monitor the adherence of field application teams to waterbody setbacks, seasonal and biological limitations on applications, where necessary (e.g. for sensitive terrestrial insects, including bees) and weather (i.e. no rain) windows.

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[76] *Final Report: Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration*, Hwang, H-M and Young, T., UC-Davis, Dept. of Civil and Environmental Engineering, submitted to Marin Municipal Water District, April 19, 2011.

[77] *Water Quality Protection Measures for Landscape Professionals,* Foss, Carrie, D. Haver and S. Donaldson, Western Integrated Pest Management Center, Jan. 2013.

[78] The Western IPM Center (UC Davis- Div. Agriculture and Natural Resources) recommends a minimum 48-hour window for herbicide applications in advance of heavy rainfall.

[79] *Environmental Fate of Glyphosate*, J. Schuette, Environmental Monitoring and Pest Management, Department of Pesticide Regulation, Sacramento, CA (Rev. Nov. 1998).

Together, Mitigation Measure 5.2-1 and Mitigation Measure 5.5-1 reduce project impacts to water quality and aquatic organisms to less-than-significant. Professional judgment exercised by a highly trained PCA further mitigates potential risk proactively and informs the design of treatment programs which consider critical site-specific factors and environmental conditions when determining timing and method of herbicide application. All applications will be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holder with training on techniques to minimize impacts to water quality and aquatic organisms from herbicide use. BMPs published by Cal-IPC discussed earlier will be also implemented to further reduce the risk of impact to water quality.

MASTER RESPONSE 8 - BIODIVERSITY ISSUES

ISSUES

Some commentors have claimed that the draft VBMP and Draft TPEIR do not adequately address biodiversity, that the wildlife component is basically “ignored”, and that no definition of biodiversity is provided in the draft VBMP. And that the draft VBMP and Draft TPEIR need to address all stressors affecting biodiversity, and that avoidance of significant impacts on sensitive resources and biodiversity needs to be emphasized in the BMPs and recommendations in the Draft TPEIR.

RESPONSE

The draft VBMP does include a definition of biodiversity in the Glossary on page G-1, which is defined as “*The variety of life found on Earth; the variety of genes, species, populations, and the ecosystems that support them* (Pimm et. Al. 2008).” As stated on page 1-5 of the draft VBMP, the primary purposes of the MCOSD vegetation management program are to 1) maintain the natural biodiversity of the vegetation within the Marin County preserves, 2) maintain patrol, emergency and public access, and 3) manage fuel loads to reduce the threat of natural and human-caused fires. The VBMP provides a foundation for replacing the current year-to-year program fluctuations with a more systematic and consistent approach to priority setting, budgeting, staffing, and partnering with other entities, which will further improve efficiency and effectiveness over the long term.

As a vegetation and biodiversity management plan, most of the BMPs in the draft VBMP relate specifically to vegetation management rather than wildlife, consistent with the objective of providing comprehensive, long-term guidance using a science-based approach that protects and enhances conditions for both native plants and animals that occupy the MCOSD preserves. Providing improved vegetation management practices, invasive plant species control and eradication, and natural resource restoration called for in the draft VBMP all serve to enhance conditions for the native wildlife species dependent on the native cover types found in the vegetation management zones on the MCOSD preserves. And providing adequate fire controls, fuelbreaks, and strategically located access serves to help avoid and contain catastrophic wildfires that can be devastating to not only the surrounding residents and communities, but to the mosaic of vegetation types and associated wildlife dependent on the existing ecosystems for survival. BMPs for resource protection on MCOSD preserves include specific controls related to important wildlife habitat features such as bird nesting locations, roosting colonies, spotted owl nesting territories, and essential habitat for salt marsh-dependent species. These include **BMP-**

Sensitive Natural Resources-1 and **BMP-Special-Status Wildlife Species-1** through **BMP-Special-Status Wildlife Species-4**.

Contrary to some assertions made in comments on the Draft TPEIR, the document provides information on both plant and animal species that contribute to the biodiversity of the MCOSD preserves. The various natural communities and cover types found on the MCOSD preserves are described on pages 106 through 114 in **Section 5.1 Biological Resources** of the Draft TPEIR. This includes a summary of both the characteristic vegetation cover types and the associated wildlife species. The discussion of special-status species on pages through 114 through 119 of the Draft TPEIR address both plant and animal species, **Exhibits 5.1-2** and **5.1-3** show occurrences of both special-status plant and animal species, and the list of special-status species known or suspected to occur in Marin County contained in **Appendix B** of the Draft TPEIR provides information on 103 special-status animal species and 87 special-status or locally important plant species. The invasive plant species treatment programs and native revegetation practices called for in the VBMP focus on plant species and vegetative cover, but the goal is to maintain and improve biodiversity for both native plant and animal species. Improving conditions for native vegetation and special-status plant species would benefit the conditions for the associated wildlife species as well.

MASTER RESPONSE 9 - GRASSLAND HABITAT MANAGEMENT

ISSUES

Commentors have raised concerns over what they believe to be a lack of focus in the draft VBMP on grassland management and the effects of natural succession that leads to the conversion of grasslands to scrub, woodland and forest cover. As a result of fire suppression, curtailment of grazing and other factors, natural succession of grasslands to woody cover can reduce biodiversity and habitat suitability for a large number of grassland-dependent special-status plant species. Establishment and spread of invasive species, such as French broom, also pose a substantial threat to grassland habitat, both the remaining native stands and grasslands dominated by non-native grasses and forbs that still provide important habitat to a wide range of wildlife species. Invasive species also threaten the many species-status plant and animal species that are dependent on the open habitat conditions of grasslands, and which can be extirpated when the available light, moisture, and other variables essential to their survival change when trees and shrubs take over the area. Commentors believe that additional BMPs are needed to address the effects of succession, conversion and loss of grassland habitat, and need for proper management on MCOSD preserves.

RESPONSE

The draft VBMP provides a comprehensive approach to vegetation management, including protection and restoration of native grasslands and essential habitat for grassland-dependent special-status species. The draft VBMP does acknowledge the threat associated with the conversion of grasslands to woody cover in the discussion of vegetation type conversion on page 3-8 under Natural Resource Management (Protection and Restoration) subsection in Chapter 3. To assist with management of resources on MCOSD land, the plan creates a vegetation zoning system. Most native grasslands are designated as either Legacy or Sustainable Natural System Zones. The plan requires the MCOSD to provide the highest priority for protective management to vegetation in the Legacy Zone and requires protective management for vegetation in the Sustainable Natural Systems Zone. As summarized in **Table 4.1** (*Vegetation Management Objectives by Zone*) on page 4-17 of the draft VBMP, protecting and enhancing native vegetation and essential habitat for special-status species are primary objectives in all management zones, including the grasslands that characterize much of the open space lands in Marin County. Many of the BMPs related to Fire Fuel Management and Risk Reduction in **Table 7.6** of the draft VBMP serve to address the fire fuel loads of woody vegetation where it has replaced areas of grassland cover. **BMP-Fuel Management-4** calls for developing site and/or species specific rehabilitation plans to address fire actions occurring within occurrences of special-status plant species. This would include populations of special-status plant species occurring in grassland habitat that are threatened by invasive species such as French broom and succession to dense brush and woodland by native species such as coyote bush, poison oak, coast live oak, and Douglas fir. And **BMP-Fuel Management-5** calls for developing revegetation and weeding plans in conjunction with project planning when vegetation management actions could disturb habitat for special-status plants.

No revisions to the draft VBMP are necessary in response to concerns raised over the limited discussion pertaining specifically to native grassland management. Succession of grasslands to woody vegetation is a “natural” process, influenced by fire suppression, curtailment of historic grazing and other factors throughout Marin County and California. The process of grassland conversion, both from natural succession by native woody species and as a result of establishment and spread of invasive species, is not the result of some direct management practices of MCOSD that would trigger CEQA review. As basically an existing condition, there would be no “potential impact” to consider under CEQA related to this concern over grasslands habitat management, and no revisions to the Draft TPEIR are considered necessary in response to these comments. The potential impacts of implementing the VBMP on biological resources, including sensitive natural communities, such as native grasslands, are addressed adequately in **Section 5.1 Biological Resources** of the Draft TPEIR.

MASTER RESPONSE 10 - MITIGATION MEASURE 5.1-1(A)

ISSUES

Several commentors raised concerns regarding the adequacy of the mitigation measures, specifically Mitigation Measure 5.1-1(a).

RESPONSE

Mitigation Measure 5.1-1(a) was recommended in **Section 5.1 Biological Resources** of the Draft TPEIR to ensure adequate protection and avoidance of sensitive biological resources through recommended revisions to **BMP-Sensitive Natural Resources-1** of the draft VBMP. As discussed on page 134 of the Draft TPEIR, several BMPs in the draft VBMP call for establishing a buffer of at least 100 feet around sensitive resources. But the draft VBMP contains no details on how the MCOSD would implement exceptions to adherence to this 100-foot buffer setback in instances where treatment activities are unavoidable, such as control of invasive species where they threaten the viability of the sensitive resource or vegetation removal required for fire fuel management around structures and fire breaks. Revisions to **BMP-Sensitive Natural Resources-1** recommended in the Draft TPEIR define specific protocols related to necessary vegetation treatment within the standard 100-foot buffer, further define compensatory mitigation where potential significant impacts are anticipated, and provide for long-term monitoring on sensitive natural resources.

One of the concerns expressed in comments on the Draft TPEIR is the lack of seasonal restrictions on treatment activities within the standard 100-foot buffer around sensitive resources addressed in **BMP-Sensitive Natural Resources-1** and revisions recommended in Mitigation Measure 5.1-1(a). Of particular concern is the possible application of herbicides during the wet season or rain events where transmission to aquatic habitat is more likely. Some of the BMPs in the draft VBMP contain restrictions on timing of management activities to avoid sensitive resource such as **BMP-Special-Status Wildlife Species-1** which calls for seasonal restrictions to avoid bird nests in active use. But none of the BMPs in the draft VBMP specifically include restrictions on timing of herbicide application. However, as discussed in the **Master Response 7 - Mitigation Measure 5.2-1**, BMPs to be adopted by MCOSD as part of implementing the VBMP include A) using only herbicides approved for aquatic and near water environs use when treating within 100 feet of any waterbody, including wetlands, B) prohibiting the mixing or loading of herbicides within 100 feet of any waterbody, including wetlands, C) the immediate remediation of accidental spills of herbicides, which includes initial containment followed by removal using absorbent materials and excavation and removal and proper disposal of surface soils from the spill area, to minimize the risk of off-site migration in surface runoff or groundwater, and D) restricting herbicide application to 24-hour window with a less than 50 percent chance of rain. And by common practice herbicides are typically applied during the growing season of target plant species, not during the wet winter months. These BMPs dictate that vegetation treatment, fire fuel management, and other activities performed within the buffer area around sensitive natural resources would result in no additional significant impacts on water quality or biological resources.

To reinforce the importance of timing restrictions on management activities, Mitigation Measure 5.1-1(a) on page 135 of the Draft TPEIR which calls for revisions to **BMP-Sensitive Natural Resources-1** of the VBMP has been revised to include the following additional bulleted action.

- **Provide appropriate seasonal restrictions on management activities within the minimum 100 foot buffer of sensitive natural resources, and incorporate these restrictions into the treatment program. Seasonal restrictions should include prohibition on herbicides application during the wet season or in advance of forecast rain events.**

Concerns have also been expressed over the lack of performance standards with the compensatory mitigation requirements in Mitigation Measure 5.1-1(a) when full avoidance of a sensitive biological resource is not feasible as part of implementing management activities under the VBMP. Chapter 5, Plan Implementation of the draft VBMP, includes a thorough discussion of how to further evaluate and refine details of individual projects contemplated under the VBMP. This includes further review of any potential adverse effects on special-status species, wetlands, or sensitive natural communities, and determining whether any additional environmental documentation or permits are required to ensure compliance with state and federal regulations related to the protection and management of biological resources as discussed on pages 5-17 through 5-26 of the draft VBMP. Where sensitive habitat or native vegetative cover could be substantially affected, the draft VBMP calls for specifying avoidance measures to protect sensitive natural resources. In instances where potential significant impacts would occur, the draft VBMP calls for developing success criteria and monitoring procedures that would be implemented to ensure any adverse impacts are fully addressed, and to ensure successful implementation consistent with the overarching goals and objectives of the draft VBMP to maintain and enhance biological diversity on the MCOSD preserves. This would include details of any compensatory mitigation component of the project, and the performance standards and success criteria that would be monitored to ensure successful implementation and achieve adequate mitigation. The MCOSD will prepare a draft implementation plan, detailing environmental compliance, permitting, monitoring, and adaptive management relevant to the project. This thorough vetting process would serve to further ensure that potential adverse effects on sensitive natural resources are carefully considered and that appropriate compensatory mitigation is provided and implemented, where necessary.

Chapter 6, Rapid Assessment and Project Monitoring Protocols of the draft VBMP, defines the project-specific monitoring protocols that would be implemented as part of the VBMP to ensure successful implementation of all components of a specific project. This would include any compensatory mitigation that would be required as part of the project as defined in the implementation plan. The VBMP defines project-specific monitoring protocols on pages 6-12 through 6-20 of the draft VBMP. These relate back to the implementation plan prepared for the project as required under the draft VBMP, and the project-specific success criteria and monitoring procedures necessary to ensure successful implementation. Examples of success criteria for different types of projects are listed on page 5-24 of the draft VBMP, but additional criteria would be defined for any compensatory mitigation component of the project, where necessary.

While the VBMP contains substantial details to avoid and minimize impacts to sensitive natural resources and provide appropriate compensatory mitigation where avoidance is not feasible, the revisions to **BMP-Sensitive Natural Resources-1** of the draft VBMP recommended in Mitigation Measure 5.1-1(a) of the Draft TPEIR serve to memorialize these provisions in the draft VBMP, require annual monitoring of management activities to verify effects on sensitive natural resources, confirm that they are being adequately mitigated, and provide for adaptive management practices to facilitate implementation and improve success. The agency authorizations called for in the revisions to **BMP-Sensitive Natural Resources-1** in Mitigation Measure 5.1-1(a) (see ninth bullet in mitigation measure) provide an added layer of oversight, where MCOSD would typically be required as part of any permit authorization to submit annual monitoring reports for an extended period of time for individual projects requiring compensatory mitigation. These annual reports would present the results of required monitoring, and would have to demonstrate that all performance standards are fully met and ultimately that the success criteria for the project are achieved. And these authorizations typically require that monitoring and maintenance be extended until these performance standards and success criteria are met, and that contingency measures be implemented where necessary.

The revisions to **BMP-Sensitive Natural Resources-1** of the draft VBMP recommended in Mitigation Measure 5.1-1(a) specify that compensatory mitigation be provided where full avoidance of sensitive natural resources is not feasible (see fourth bullet in mitigation measure). Compensatory mitigation would ensure no permanent loss of sensitive natural resources. Where necessary, details of the compensatory mitigation would be defined in the treatment program. The need for compensatory mitigation would depend on the rarity of the affected sensitive natural resource, magnitude and permanence of the impact, and the level of legal protection. These would be developed as part of the project review and implementation process discussed above. The actual performance standards and success criteria for any project-specific compensatory mitigation would range widely, given the varied sensitive natural resources that could be affected, their sensitivity and status, and range of methods available to achieve adequate mitigation. The compensatory mitigation element of the treatment program required under the revisions to **BMP-Sensitive Natural Resources-1** called for in Mitigation Measure 5.1-1(a) would establish project-specific performance standards and success criteria, and would include provisions for contingency measures to remediate projects that do not meet the performance standards.

The revisions to **BMP-Sensitive Natural Resources-1** of the draft VBMP recommended in Mitigation Measure 5.1-1(a) includes provisions to monitor all management activities within any approved treatment program occurring within the minimum 100-foot buffer of sensitive natural resources (see third bullet in mitigation measure). MCOSD staff would track the degree to which management activities actually involved work within the minimum 100-foot buffer of sensitive natural resources. An annual monitoring report would be prepared summarizing the results of various treatment programs for that year, degree of incursion into the minimum 100-foot buffer area, and comparison to broader management activities. Recommendations would be made for adaptive management practices or revisions to BMPs where warranted based on the result of the annual monitoring. These additional provisions in Mitigation Measure 5.1-1(a) would serve to reinforce the implementation procedures in the VBMP where potential impacts on sensitive natural resources are unavoidable, including developing project-specific success criteria and monitoring procedures that would be implemented to ensure any significant adverse impacts are fully addressed.

Collectively, the provisions in the draft VBMP related impact avoidance and project monitoring, the revisions to **BMP-Sensitive Natural Resources-1** recommended in Mitigation Measure 5.1-1(a), and the oversight provided by resource agencies would ensure that all potential adverse impacts on sensitive natural resources are adequately addressed, and would reduce any potentially significant impacts to a level of less-than-significant. No additional revisions to the draft VBMP or Draft TPEIR are necessary in response to concerns expressed over the adequacy of Mitigation Measure 5.1-1(a)

MASTER RESPONSE 11 - ENFORCEABILITY OF BMPS AND DECISION MAKING PROCESS

ISSUES

Commentors have raised concerns over the feasibility of implementing the broad goals and complex BMPs contained in the draft VBMP, the effects of limited budgets on successful implementation of invasive species controls, native revegetation and other objectives. Concerns have also been raised over the current procedures for identifying and protecting sensitive resources, and the need for defining a process to review and approve the treatment programs recommended in the Draft TPEIR when management activities must be performed within 100 feet of sensitive resources. Commentors believe that these issues must be further analyzed and that the review and approval process for site-specific treatment programs needs to be defined and memorialized in some way in the draft VBMP and Draft TPEIR to ensure successful implementation and resource protection.

RESPONSE

Contrary to the assertion made by some commentors, the draft VBMP includes considerable information on the procedures for identifying sensitive natural resources, carefully evaluating the potential for adverse effects of project-specific management activities, and defines a process for refinement, public input and implementation. Chapter 5, Plan Implementation of the draft VBMP, includes a thorough discussion of how to further evaluate and refine details of individual projects contemplated under the VBMP. This includes further review of any potential adverse effects on special-status species, wetlands, or sensitive natural communities, and determining whether any additional environmental documentation or permits are required to ensure compliance with state and federal regulations related to the protection and management of biological resources as discussed on pages 5-17 through 5-26 of the draft VBMP. Where sensitive habitat or native vegetative cover could be substantially affected, the VBMP calls for specifying avoidance measures to protect sensitive natural resources. In instances where potential impacts cannot be avoided, the VBMP calls for developing success criteria and monitoring procedures to ensure any adverse impacts are fully addressed. This would include details of any compensatory mitigation component of the project, and the performance standards and success criteria that would be monitored to ensure successful implementation and achieve adequate mitigation. The MCOSD will prepare a draft implementation plan detailing any environmental compliance, permitting, monitoring, and adaptive management to be applied to the project. This thorough vetting process would serve to further ensure that potential adverse effects on sensitive natural resources are carefully considered and that appropriate compensatory mitigation is provided and implemented, where necessary.

Chapter 6, Rapid Assessment and Project Monitoring Protocols of the draft VBMP, defines the project-specific monitoring protocols. This would include any compensatory mitigation that would be required as part of the project. The project-specific monitoring protocols called for as part of revegetation and restoration projects are defined on pages 6-12 through 6-20 of the draft VBMP. These relate back to the project-specific implementation plan prepared for the project as required under the draft VBMP, and the project-specific success criteria and monitoring procedures necessary to ensure successful implementation. Examples of success criteria for different types of projects are listed on page 5-24 of the draft VBMP, but additional criteria would be defined for any compensatory mitigation component of the project, where necessary.

With adoption of the VBMP, the MCOSD would then be obligated to ensure its successful implementation. Proposed management activities would be reviewed through the implementation plan process described above, and be subject to the prioritization process defined on pages 5-26 through 5-30 of the draft VBMP. The draft implementation plan called for as part of this process would include a review of any environmental compliance and permitting, if needed, and would define monitoring and adaptive management provisions. The revisions to **BMP-Sensitive Natural Resources-1** of the VBMP recommended in Mitigation Measure 5.1-1(a) includes provisions to monitor all management activities within any approved treatment program occurring within the minimum 100-foot buffer of sensitive natural resources (see third bullet in mitigation measure). MCOSD staff would track the degree to which management activities actually involved work within the minimum 100-foot buffer of sensitive natural resources. An annual monitoring report would be prepared summarizing the results of various treatment programs for that year, degree of incursion into the minimum 100-foot buffer area, and comparison to broader management activities. Recommendations would be made for adaptive management practices or revisions to BMPs where warranted based on the result of the annual monitoring. These additional provisions in Mitigation Measure 5.1-1(a) would serve to reinforce the implementation procedures in the VBMP where potential significant impacts on sensitive natural resources would occur, including developing project-specific success criteria and monitoring procedures that would be implemented to ensure any significant adverse impacts are fully addressed.

Collectively, the provisions in the draft VBMP related to sensitive resource avoidance and project-specific monitoring, the revisions to **BMP-Sensitive Natural Resources-1** recommended in Mitigation Measure 5.1-1(a) which memorialize any required compensatory mitigation, together with the oversight provided by the required resource agency authorization would ensure that all potential adverse impacts on sensitive natural resources are adequately addressed, and would reduce any potentially significant impacts to a level of less-than-significant, as concluded under *Impact 5.1-1* in **Section 5.1 Biological Resources** of the Draft TPEIR. No additional revisions to the draft VBMP or Draft TPEIR are necessary in response to concerns expressed over the enforceability of BMPs and decision making process.

MASTER RESPONSE 12 - DEFERRAL OF ANALYSIS AND MITIGATION

ISSUES

Claims have been made that the Draft TPEIR fails to satisfy CEQA requirements because it improperly defers the disclosure, analysis, and mitigation of potentially significant impacts. Some commentors have stated that the treatment programs recommended in the Draft TPEIR, for activities performed within 100 feet of sensitive resources, should have been part of the CEQA analysis to fully describe potential impacts and determine the adequacy of recommended measures. In other comments, concerns have been raised over the lack of performance standards in defining “compensatory mitigation”. Still others claim that insufficient analysis is provided in the Draft TPEIR to conclude that significant impacts have been reduced to a less-than-significant impact. Commentors have also stated that the Draft TPEIR fails to provide adequate mitigation measures to avoid impacts. For example, commentors have stated that the mitigation measure of applying herbicides according to label requirements is deficient when labels are incorrect or misleading.

RESPONSE

Section 5.1 Biological Resources and other sections of the Draft TPEIR provide a thorough analysis of the potential impacts of the draft VBMP and identifies feasible mitigation measures that adequately address the significant impacts of the VBMP. Regarding the expectations of some commentors that all potential impacts be quantitatively described in the Draft TPEIR, one must understand that the VBMP is a high level comprehensive management plan, not a project development plan that is constructed at one time and has quantifiable direct and indirect potential impacts. The MCOSD prepared a program EIR for the VBMP because the actions described in the plan are part of one large project related geographically and in connection with a plan (*State CEQA Guidelines* Section 15168(a)). As required by CEQA, the MCOSD will examine subsequent projects in light of the TPEIR to determine whether additional environmental review is necessary. Section 15168(d) of the *State CEQA Guidelines* envisions that a program EIR will be used in conjunction with subsequent EIRs and negative declarations where necessary. The purpose of a program EIR is to look at series of related actions comprehensively, with the subsequent environmental review considering the project or site specific details. Many of the deferral of analysis and mitigation concerns raised by the commentors are for issues that are better addressed through a subsequent environmental document.

Additionally, as a long-term management plan, the VBMP provides a framework for protecting and restoring natural habitat across 34 open space preserves encompassing over 14,600 acres, and contains BMPs and policies that are designed to avoid and minimize any potential adverse effects of implementation. Substantial data is available on the varied biological resources associated with each of the preserves, including vegetative cover types and occurrences of special-status species, sensitive natural communities and jurisdictional waters. However, the MCOSD has not conducted detailed surveys across much of the preserves given the financial infeasibility, fact that some areas remain intact with little risk of invasive species or other management needs, and that conditions are continuously changing. This changing dynamic is part of the inherent value of natural systems, but also a challenge for land managers and reason that an adaptive management plan is crucial, to address changing conditions and allow for use of the most successful management tools to address threats and ensure that habitat restoration efforts are successful. Part of that success is adjusting the established practices for construction, restoration, and even monitoring and maintenance, rather than relying on a routine method that does not necessarily capture the state-of-art and best management practices that evolve over time. And the VBMP allows for those adjustments as part of their annual monitoring and project prioritization process outline in Chapter 5 Plan Implementation of the draft VBMP.

Expecting that the MCOSD conduct systematic surveys over 14,600 acres to determine the location of all sensitive natural resources, and then prepare detailed plans that addresses each management activity required in the short-term and long-term for the preserves, as suggested in the reasoning of claims by some commentors, is not only financially and logistically impossible, but it does not recognize the fact that the 34 open space preserves MCOSD manages are dynamic, natural systems under continuous change. Any plan prepared based on current conditions may not be appropriate or address management needs and habitat threats in the future. Conducting surveys in advance of performing management activities is an accepted method of confirming whether any sensitive resources are present in a given location, confirming whether past occurrences are still present, and determining whether previously unidentified resources are present in locations where little if any past survey work has been performed. As an adaptive management plan, the VBMP calls for refinement of baseline data, on-going monitoring, and prioritization of treatment based on threats to high-value resources and native biodiversity from invasive species and pathogens, as well as risk from wildfires. This continuous process of updating and expanding available data on sensitive resources and threats, monitoring of successes and failures, and prioritizing key projects to be implemented as part of that adaptive management program, and allows for constant refinement and improvement of the VBMP.

As part of implementation, the draft VBMP lays out a process for identifying the presence or absence of sensitive resources in advance of a specific project. In those instances, confirmation on whether any sensitive resources are present is conducted in advance of finalizing the plans for the anticipated management activity. The draft VBMP includes BMPs that emphasize avoidance of those sensitive resources and lays out a procedure for minimizing potential adverse impacts. Chapter 5, Plan Implementation of the draft VBMP, includes a thorough discussion of how to further evaluate and refine details of individual projects contemplated under the VBMP. This includes further review of any potential adverse effects on special-status species, wetlands, or sensitive natural communities, and determining whether any additional environmental documentation or permits are required to ensure compliance with state and federal regulations, as discussed on pages 5-17 through 5-26 of the draft VBMP. Where sensitive habitat or native vegetative cover could be substantially affected, the VBMP calls for specifying avoidance measures to protect sensitive natural resources. In instances where potential significant impacts would occur, the draft VBMP calls for developing success criteria and monitoring procedures that would be implemented to ensure any adverse impacts are fully addressed, and to ensure successful implementation consistent with the overarching goals and objectives of the VBMP. This would include details of any compensatory mitigation component of the project, and the performance standards and success criteria that would be monitored to ensure successful implementation and achieve adequate mitigation. A draft implementation plan would be prepared by MCOSD staff, detailing any environmental compliance, permitting, monitoring, and adaptive management to be applied to the project. This thorough vetting process would serve to further ensure that potential adverse effects on sensitive natural resources are carefully considered and that appropriate compensatory mitigation is provided and implemented, where necessary.

Chapter 6, Rapid Assessment and Project Monitoring Protocols of the draft VBMP, defines the project-specific monitoring protocols that would be implemented as part of the VBMP to ensure successful implementation of all components of a specific project. This would include any compensatory mitigation that would be required as part of the project as defined in the implementation plan in meeting the goals and objectives of the VBMP. The project-specific monitoring protocols called for as part of revegetation and restoration projects are defined on pages 6-12 through 6-20 of the draft VBMP. These relate back to the project-specific implementation plan prepared for the project as required under the VBMP, and the project-specific success criteria and monitoring procedures necessary to ensure successful implementation. Examples of success criteria for different types of projects are listed on page 5-24 of the draft VBMP, but additional criteria would be defined for any compensatory mitigation component of the project, where necessary.

Collectively, the provisions in the draft VBMP related to sensitive resource avoidance and project-specific monitoring, the revisions to **BMP-Sensitive Natural Resources-1** recommended in Mitigation Measure 5.1-1(a) that memorialize any required compensatory mitigation, together with the oversight provided by the required resource agency authorization would ensure that all potential adverse impacts on sensitive natural resources are adequately addressed, and would reduce any potentially significant impacts to a level of less-than-significant. No additional revisions to the draft VBMP or Draft TPEIR are considered necessary in response to concerns expressed over the deferral of analysis and mitigation on sensitive natural resources that could be affected by management activities implemented as part of the VBMP.

9.5 RESPONSES TO COMMENTS

All comments, letters 1 through 32 submitted to the Marin County Open Space District and public hearing minutes of the Marin County Parks and Open Space Commission held May 21, 2015, are presented in the following pages. The original letters are reproduced and comments are numbered for referencing with responses. Some responses refer readers to other comments or responses in the section or to the pages in the Draft TPEIR where specific topics are discussed.

Comment Letter 1

United States Department of the Interior

NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, San Francisco, California 94123

IN REPLY REFER TO:

N50 (GOGA-NRMR)

JUN - 4 2015

James Raives
Marin County Open Space District
3501 Civic Center Dr. Suite 260
San Rafael, CA 94903

Re: Comments on the draft Tiered Program Environmental Impact Report for the draft Vegetation and Biodiversity Management Plan

Dear Mr. Raives:

1-1

We are pleased that the Marin County Open Space District (MCOSD) has developed a draft Tiered Program Environmental Impact Report (TPEIR) and associated draft Vegetation and Biodiversity Management Plan (VBMP). We support the primary goals of the plan which include: 1) Manage vegetation to preserve and protect native habitat and biodiversity; 2) Coordinate fire and vegetation management to reduce invasive plant infestations, increase public safety, protect native habitats and reduce wildfire risk; and 3) Provide opportunities for the public to engage in stewardship through participation in volunteer vegetation management activities. Golden Gate National Recreation Area (GGNRA) lands are close or adjacent to MCOSD lands in several locations and we are concerned about the potential for non-native invasive plants to spread from MCOSD onto GGNRA lands. We believe the VBMP will address this concern.

We would like to express our overall support for the MCOSD TPEIR and VBMP; protecting the ecological integrity of MCOSD lands as described in these documents will directly benefit GGNRA lands.

If you have any questions regarding our comments, please feel free to contact Alison Forrestel, Supervisory Vegetation Ecologist, at (415) 289-1837.

Sincerely,

Christine Lehnertz
General Superintendent

RESPONSE TO COMMENT LETTER 1 - CHRISTINE LEHNERTZ, GENERAL SUPERINTENDENT, NATIONAL PARK SERVICE, UNITED STATES DEPARTMENT OF THE INTERIOR, JUNE 4, 2015

Response to Comment 1-1

Comment noted. No additional response required.

DEPARTMENT OF TRANSPORTATION
DISTRICT 4
P.O. BOX 23660, MS-10D
OAKLAND, CA 94623-0660
PHONE (510) 286-5528
FAX (510) 286-5559
TTY 711
http://www.dot.ca.gov/dist4/

Comment Letter 2

Serious Drought.
Help save water!

June 15, 2015

MRN000080
SCH #2013112063

Mr. James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903

Dear Mr. Raives:

Vegetation and Biodiversity Management Plan – Draft Environmental Impact Report (DEIR)

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. The proposed project consists of strategies and tools for addressing invasive weeds, reducing fire fuel loads, and preserving native species and habitats within the Marin County Open

Caltrans' new mission, vision, and goals signal a modernization of our approach to California's transportation system. We review this local development for impacts to the State Highway System in keeping with our mission, vision, and goals for sustainability/livability/economy, and safety/health. We provide these comments consistent with the State's smart mobility goals that support a vibrant economy, and build communities, not sprawl. The following comments are based on the project application provided to us. Additional comments may be forthcoming.

Coordination with Caltrans

2-1 Where proposed work will occur in our Right of Way (ROW), please provide Caltrans with advanced notice. We encourage ongoing coordination between Caltrans and the District on projects located within State ROW.

Encroachment Permit

2-2 Work that encroaches onto the State ROW requires an encroachment permit that is issued by Caltrans. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating the State ROW must be submitted to: Office of Permits, California Department of Transportation, District 4, P.O. 23660, Oakland, CA 94623-0660. Traffic-related mitigation measures should be incorporated into the construction plans during the encroachment permit process. As soon as they are available, please forward one hard

2-2 continued

copy and one CD of the environmental document, along with the TIS including the Technical Appendices. See the website link below for more information.

http://www.dot.ca.gov/hq/traffops/developserv/permits/

Please feel free to call or email Greg Currey at (510) 286-5623 or gregory.currey@dot.ca.gov with any questions regarding this letter.

Sincerely,

Pat C.

PATRICIA MAURICE
District Branch Chief
Local Development – Intergovernmental Review

RESPONSE TO COMMENT LETTER 2 - PATRICIA MAURICE, DISTRICT BRANCH CHIEF, DEPARTMENT OF TRANSPORTATION, CALIFORNIA STATE TRANSPORTATION AGENCY, JUNE 15, 2015

Response to Comment 2-1

Comment noted. No additional response required.

Response to Comment 2-2

Comment noted. No additional response required.

Comment Letter 3

SUSTAINABLE TAMALMONTE
215 JULIA AVENUE
MILL VALLEY, CA 94941

May 20, 2015

Marin County Open Space District Board of Directors
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903-4157
Attention: James Raives
JRaives@marincounty.org

Dear Marin County Open Space District Board of Directors,

We are reviewing the draft Tiered Program Environmental Impact Report for the Vegetation and Biodiversity Management Plan and will be preparing comments to the Marin County Open Space District (MCOSD) as requested by July 8, 2015. We recognize the challenge of protecting natural habitats, preserving diversity and reducing the risk of wildfire.

3-1 We want you to know that our initial review of the TPEIR raises concerns regarding the continued use of toxic pesticides in our public spaces, even within 100' of water. There is inconsistency expressed in the plan by both prohibiting and then allowing their use. Both the public and members of the Board of Supervisors have expressed their desire to eliminate the use of such toxic substances.

3-2 In addition, we are concerned about the proposed 'mitigation measures' that do not eliminate the significant adverse impacts of toxic substances such as glyphosate. A public agency may not rely on mitigation measures of uncertain efficacy or feasibility. CEQA requires an agency to evaluate the environmental effects of a project at the earliest possible stage in the planning process. Adequate specificity is essential for assessment of management plans in order to achieve the desired objectives without negating one, and assuring public health and safety as well as long term sustenance of open space habitats and species based on the most current scientific knowledge.

We urge the Board of Directors to recommend revisions reflecting these concerns.

Respectfully,
/s/
Ann Spake, Executive Committee Member, Sustainable TamAlmonte
/s/
Sharon Rushton, Chairperson, Sustainable TamAlmonte

RESPONSE TO COMMENT LETTER 3 - ANN SPAKE, EXECUTIVE COMMITTEE MEMBER, SUSTAINABLE TAMALMONTE, SHARON RUSHTON, CHAIRPERSON, SUSTAINABLE TAMALMONTE, SUSTAINABLE TAMALMONTE, MAY 20, 2015

Response to Comment 3-1

Comment noted. Additionally, the VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to managing vegetation in order to increase the program's efficiency and effectiveness. As such, it neither promotes nor prohibits the use of herbicides. Rather, it requires the use of an integrated pest management approach, which is a science based approach requiring the use of the least environmentally damaging treatment method. Additionally, it should be noted that the draft VBMP does not prohibit the use of herbicides. For example **Table 4.7** (*Recommended Treatment Options for Target Invasive Plants*) in the draft VBMP describes specific chemical control methods as recommended treatment options for target invasive plants. Furthermore, **BMP-Invasive Plant-2** limits but does not prevent herbicide use within 100 feet of sensitive natural resources.

Response to Comment 3-2

It is incorrect to state that the proposed 'mitigation measures' do not eliminate the significant adverse impacts of toxic substances such as glyphosate. The TPEIR concludes that with implementation of the mitigation measures identified in the TPEIR impacts associated with herbicide use from activities related to the continued implementation of the VBMP would be reduced to a less-than-significant impact.

Comment Letter 4

SUSTAINABLE TAMALMONTE ET AL
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July 6, 2015

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Re: Public Comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

We write on behalf of Sustainable TamAlmonte, Watershed Alliance of Marin, Health and Habitat, Inc., Moms Advocating Sustainability, Turning Green, Gallinas Watershed Council, Marin Water Coalition, Sustainable Homestead Valley and ourselves to comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan ("Project") and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

Sustainable TamAlmonte is a group of Tam Valley and Almonte residents who want to preserve and enhance the environmental qualities of their unique bayside communities and Marin County as a whole. The members of Sustainable TamAlmonte support truly sustainable land use and vegetation management in Marin and particularly in the Tamalpais Community Services District and the Almonte Sanitary District of Unincorporated Marin, and have grave concerns about the environmental, health and safety impacts that result from poor land use and vegetation management planning, including environmentally detrimental projects. Therefore, Sustainable TamAlmonte has a strong interest in enforcing environmental laws to protect the valuable environmental resources of Marin County, including the Tam Valley and Almonte communities, and the health and safety of current and future residents.

Watershed Alliance of Marin (WAM), a 501c3 project of MarinLink, is a network of advocacy, education, and land conservation organizations who work to protect and restore Marin County's watersheds and the native wildlife nourished by our natural heritage.

Health & Habitat, Inc. is a 501c3 incorporated in 1987. It promotes a holistic approach to life, health and the environment, and helps to achieve a healthy state of equilibrium through education, research and conservation of natural resources, and public charity. It disseminates information in the public interest concerning the above subjects through, but not limited to, lectures, publications, and other media.

MOMS Advocating Sustainability (MOMAS) is a group of mothers and families committed to creating healthy communities for children by reducing the use of household and environmental toxins.

Turning Green is a student led global movement devoted to education and advocacy around environmentally sustainable and socially responsible choices for individuals, schools, and communities. TG seeks to engage youth in the transition from conventional to conscious living, empowering this generation and mobilizing action to sustain a healthy planet.

The **Gallinas Watershed Council**'s mission is to: Connect the people who live and work in Las Gallinas Valley with their creek and watershed; Advance local conservation action; and Promote watershed restoration, protection and education. We are a fiscally sponsored 501c3 of MarinLink. As watershed advocates, we are committed to environmental protection and reducing the use to toxic chemicals in all areas.

The **Marin Water Coalition** (MWC) is an environmental organization affiliated with the Social Justice Center of Marin (see SJCM.org under task forces), which has been active in monitoring MMWD policies with regard to water conservation and watershed management and efficiencies, as well as in opposing the proposed San Rafael desalination plant on environmental grounds.

Working locally, **Sustainable Homestead Valley** represents Homestead Valley Community on issues of economic and environmental sustainability by bringing neighbors together, raising awareness, and advocating for all life and future generations.

I. INTRODUCTION

We share Rachel Carson's concerns expressed in her book "Silent Spring" (1962)[1] about the human health effects and environmental impacts caused by the use of pesticides.

We also support the Precautionary Principle. The Introduction of the Marin Countywide Plan states; "The Precautionary Principle, another conceptual framework considered during the preparation of the Plan, carries the sense of foresight and preparation, and is the common-sense idea behind many adages: 'Be careful', 'Better safe than sorry'; 'Look before you leap'; 'First, do no harm'. The precautionary principle is an approach characterized by minimizing or eliminating potential hazards at the onset of an activity instead of the approach that determines an 'acceptable level of harm'."[2]

We are therefore concerned about the DRAFT Marin County Open Space Vegetation and Biodiversity Management Plan's ("Project") wide use of a number of herbicide products to control weeds and clear vegetation for fire safety. We are further concerned that the DRAFT Marin County Open Space District (MCOSD) Vegetation and Biodiversity Management Plan (VBMP) Tiered Program Environmental Impact Report (DRAFT TPEIR) fails to apply the Precautionary Principle and fails to adequately address the Project's potentially significant impacts with respect to toxic herbicides.

CEQA has two basic purposes, neither of which the DRAFT Marin County Open Space District (MCOSD) Vegetation and Biodiversity Management Plan (VBMP) ("Project") Tiered Program Environmental Impact Report (DRAFT TPEIR) satisfies.

First, CEQA is designed to inform decision makers and the public about the potential, significant environmental effects of a project.[3] The EIR is the

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[1] Carson, R., 1962. Silent Spring. Houghton Mifflin.
[2] Marin County Community Development Agency, 2007. Marin Countywide Plan. Marin
[2] Marin County Community Development Agency, 2007. Marin Countywide Plan. Marin County. Pg. 1.3-11
[3] 14 Cal. Code Regs. ("CEQA Guidelines") § 15002(a)(1).

"heart" of this requirement.[4] The EIR has been described as "an environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return."[5]

Second, CEQA directs public agencies to avoid or reduce environmental damage when possible by requiring alternatives or mitigation measures.[6]

4-1

The DRAFT TPEIR fails to satisfy these purposes by failing to disclose, accurately identify and adequately analyze, including improperly deferring the analysis of, all potentially significant environmental impacts of the Draft Vegetation and Biodiversity Management Plan, and failing to provide adequate mitigation measures to avoid impacts. As a result, the DRAFT TPEIR fails as an informational document and falls short of CEQA's mandates.

II. THE DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS ASSOCIATED WITH GLYPHOSATE AND COMMERCIAL GLYPHOSATE HERBICIDE FORMULATIONS

4-2

The DRAFT TPEIR fails to disclose, analyze and mitigate potentially significant environmental impacts from glyphosate and commercial glyphosate herbicide formulations because it does not properly describe the herbicide and the formulations and fails to properly disclose and analyze the toxicity, non-target impacts, high activity and mobility, and fire risk of glyphosate and glyphosate herbicide formulations.

The DRAFT TPEIR (Page 248) describes Glyphosate; "Glyphosate is generally the first choice herbicide due to its low toxicity and low risk of non-target impacts due to the lack of activity in the soil."[7] In **Appendix E Herbicide Use** of the DRAFT TPEIR, the highest toxicity score assigned to Glyphosate is "3" (moderately toxic).

[4] *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 84.
[5] *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810.
[6] CEQA Guidelines § 15002(a)(2) and (3) (*See also Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564; *Laurel Heights Improvement Ass'n v. Regents of the University of California* (1988) 47 Cal.3d 376, 400.).
[7] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 248.

4-2 continued

The above description is incorrect. Glyphosate is highly and very highly toxic, according to U.S. EPA's Toxicity Scores (See Exhibit 5.5-5 below)[8], and chronically toxic. Glyphosate can have high activity and movement in the soil, depending on conditions, as well as in air and water. Glyphosate use has a significant risk of non-target impacts. Moreover, glyphosate is a patented desiccant and could greatly increase the risk of fire.

Exhibit 5.5-5 U.S. EPA's Ecotoxicity Categories for Terrestrial and Aquatic Organisms and Toxicity Score

Toxicity Category	*Aquatic Organism LC_{50} (ppm)*	*Terrestrial Organism - Oral LC_{50} (mg/kg-bw)*	*Terrestrial Organism - Dietary LC_{50} (ppm)*	*Bee LD_{50} (ug/bee)*	*Toxicity Score*
Practically non-toxic	>100	>2000	>5000	>=11	1
Slightly toxic	>10-100	501-2000	1001-5000		2
Moderately toxic	>1-10	51-500	501-1000	2-11	3
Highly toxic	0.1-1	10-50	50-500		4
Very highly toxic	<0.1	<10	<50	<2	5

Source: U.S. Environmental Protection Agency (USEPA). 2012. Technical Overview of Ecological Risk Assessment. Available: http://www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm.

4-3

A. The Draft TPEIR Fails To Acknowledge That Glyphosate Is Highly And Chronically Toxic And Commercial Glyphosate Herbicide Formulations Are More Toxic

Independent studies show that glyphosate, the active ingredient in glyphosate herbicide formulations identified for use in the Vegetation and Biodiversity Management Plan (AquaMaster, Rodeo, and Roundup Custom), is highly and very highly toxic, in accordance with U.S. EPA's Toxicity Scores (See Exhibit 5.5-5)[9], and chronically toxic.

According to genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[10] "The added ingredients (adjuvants) are toxic[11] and

[8] See Draft TPEIR for the Draft MCOSD VBMP, Exhibit 5.5-5, Pg. 261.
[9] See Draft TPEIR for the Draft MCOSD VBMP, Exhibit 5.5-5, Pg. 261.
[10] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

4-3 continued

increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[12 13 14,,15]

"In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[16,,17]

4-4

1. Toxic Effects on Aquatic Organisms:
Glyphosate can contaminate surface water either directly as a result of aquatic weed control or indirectly when glyphosate bound to soil particles is washed into rivers, streams, lakes and estuaries[18].

Studies show that peak herbicide concentrations tend to occur during the first runoff after herbicide application and that herbicide flushes can occur during runoff for several weeks to months following application.

When herbicides enter our waterways via stormwater runoff, they can cause a variety of adverse effects to aquatic species. In addition to directly

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11 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

12 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105. doi:10.1021/tx800218n.

13 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33. doi:10.1002/ps.539.

14 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

15 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

16 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691.

17 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

18 World Health Organisation (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

4-4 continued

impacting salmon and steelhead, the toxics can harm or kill the aquatic insects that salmon eat. Pollution risks vary depending on the particular chemical, the amount transported in stormwater, and environmental persistence.[19]

4-5

Studies with fish show that glyphosate can be moderately toxic alone, but when combined with the surfactant normally found in commercial products, the toxicity is greater.[20] [21] Glyphosate and commercially formulated products containing POEA (Polyoxyethylenetallowamine) surfactant are toxic to fish and to some aquatic invertebrates[22] [23]. POEA is about 30 times more toxic to fish than glyphosate[24].

The toxicity of glyphosate increases with higher temperatures in fish; one study found that the toxicity of glyphosate doubled in bluegill and in rainbow trout test subjects when the temperature of the water was increased from 45 to 63 degrees F.[25] [26]

The thesis entitled; "Neurotoxicity of pesticides to salmon: Physiology to Ethology" by Keith Bryan Tierney with the Simon Fraser University

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[19] National Oceanic and Atmospheric Administration, 2012. Water Quality: How Toxic Runoff Affects Pacific Salmon and Steelhead. National Oceanic and Atmospheric Administration. Available at: http://www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/stormwater_fact_sheet.pdf

[20] Folmar, L.C. et al (1979) "Toxicity of the herbicide glyphosate and several of its formulations to fish and aquatic invertebrates." Archives of Environmental Contamination and Toxicology, v 8, 269-278.

[21] Austin, A.P., et al (1991), "Impact of an organophosphate herbicide (glyphosate) on periphyton communities developed in experimental streams." Bulletin of Environmental Contamination and Toxicology, v. 47, 29-35.

[22] World Health Organisation (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

[23] Cox, C., 1995b. Glyphosate, Part 2: Human Exposure and Ecological Effects. J. Pesticide Reform 15 (4), 14-20.

[24] Servizi, J.A., Gordan, R.W. and Martens, D.W., 1987. Acute toxicity of Garlon 4 and Roundup herbicides to salmon, Daphnia and trout. Bull. Environ. Contam. Toxicol. 33, 355-361. Cited in Cox, C. 1995b op cit 12.

[25] Folmar, L.C. et al (1979) "Toxicity of the herbicide glyphosate and several of its formulations to fish and aquatic invertebrates." Archives of Environmental Contamination and Toxicology, v 8, 269-278.

[26] Austin, A.P., et al (1991), "Impact of an organophosphate herbicide (glyphosate) on periphyton communities developed in experimental streams." Bulletin of Environmental Contamination and Toxicology, v. 47, 29-35.

4-5 (cont.)

Biological Sciences Department[27], demonstrates that pesticides routinely found in the environment can adversely affect neurological systems in salmon. When the nervous system is affected, it impairs environmental information about food, predators, mates, siblings or environmental conditions.

The major focus of Tierney's studies is on the impairment of the relatively exposed olfactory sensory neurons (OSNs), since their functionality is critical to several indispensable behaviors. The responses of OSNs to various behaviorally-relevant odorants were impaired following exposure to several pesticide classes, including triazine (e.g. atrazine), carbamate (e.g. IPBC), organophosphorus (e.g. dimethoate), and phenylurea (e.g. linuron) pesticides, as well as a pesticide formulation (i.e. Roundup). In many cases, within minutes of exposure to environmentally realistic (part per billion) concentrations, impairments of greater than 50% in OSN responses were noted.

In an exposure, the uptake and distribution of pesticides and their metabolites have capacity to alter the neurological system. Clearly, the impairment of this system translates to a genuine survival challenge.

2. Toxic Effects on Amphibians:

4-6

Vernal pools are sensitive environments that provide critical habitats for many species, including amphibians. In 2005 and 2006, water samples were collected from vernal pools and adjacent flowing waters in parks in Iowa, Washington, D.C., and Maryland, prior to and just after the local use of glyphosate (Battaglin et al. 2008)[28]. At each site there was a treatment pool (with adjacent glyphosate use), a control pool (with no glyphosate use nearby), and a flowing stream (with multiple potential glyphosate sources). In addition, a park in Wyoming was a study control with no reported glyphosate use nearby. Results indicate that vernal pools and adjacent streams can be contaminated by the use of herbicides within parks to control weeds in cropped areas or to kill noxious or nonindigenous plants. Contamination also originates from pesticide use occurring outside park

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[27] Tierney, K., 2007. Neurotoxicity of pesticides to salmon: Physiology to ethology. Simon Fraser University. Available at: http://summit.sfu.ca/item/8281

[28] Battaglin, W. A., K. C. Rice, M. J. Focazio, S. Salmons, and R. X. Barry. 2009. The occurrence of glyphosate, atrazine, and other pesticides in vernal pools and adjacent streams in Washington, D.C., Maryland, Iowa, and Wyoming, 2005-200. Environmental Monitoring and Assessment 155:281-307

4-6 (cont.)

boundaries (Battaglin et al. 2008)[29]. Glyphosate was detected in 31 of 76 samples with a maximum concentration of 328 µg/L, measured in a sample collected from a vernal pool in Rock Creek Park, Washington, D.C. That sample was collected seven days after glyphosate was applied by backpack sprayer in the area near the site to control lesser celandine (Ranunculus ficaria) and one day after approximately 3 cm of rain fell at the site.

4-7

Deleterious effects on the development and survival of amphibians have been observed at various levels of exposure to commercial glyphosate formulations, in some cases at concentrations of 1,000 µg/L or less (Cauble and Wagner 2005[30]; Edginton et al. 2004[31]; Howe et al. 2004[32]; Relyea 2005[33]; Dinehart et al. 2009[34]). Most of these studies indicate that commercial glyphosate formulations are more toxic than pure glyphosate due to the effects of the surfactants used (Howe et al. 2004[35]: Bringolf et al. 2007[36]).

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29 Battaglin, W. A., K. C. Rice, M. J. Focazio, S. Salmons, and R. X. Barry. 2009. The occurrence of glyphosate, atrazine, and other pesticides in vernal pools and adjacent streams in Washington, D.C., Maryland, Iowa, and Wyoming, 2005-200. Environmental Monitoring and Assessment 155:281-307

30 Cauble, K., and R. S. Wagner. 2005. Sublethal effects of herbicide glyphosate on amphibian metamorphosis and development. Bulletin of Environmental Contamination and Toxicology 75:429–435.

31 Edginton, A. N., P. M. Sheridan, G. R. Stephenson, D. G. Thompson, and H. J. Boermans. 2004. Comparative effects of pH and Vision® on two life stages of four anuran amphibian species. Environmental Toxicology and Chemistry 23(4):815–822

32 Howe, C. M., M. Berrill, B. D. Pauli, C. C. Helbing, K. Werry, and N. Veldhoen. 2004. Toxicity of glyphosate-based pesticides to four North American frog species. Environmental Toxicology and Chemistry 23(8):1928–1934.

33 Relyea, R. A. 2005. The lethal impacts of Roundup® and predatory stress on six species of North American tadpoles. Archives of Environmental Contaminant Toxicology 48:351–357.

34 Dinehart, S. K., L. M. Smith, S. T. McMurry, T. A. Anderson, P. N. Smith, and D. A. Haukos. 2009. Toxicity of a glufosinate- and several glyphosate-based herbicides to juvenile amphibians from the Southern High Plains, USA. Science of the Total Environment 407:1065–1071.

35 Howe, C. M., M. Berrill, B. D. Pauli, C. C. Helbing, K. Werry, and N. Veldhoen. 2004. Toxicity of glyphosate-based pesticides to four North American frog species. Environmental Toxicology and Chemistry 23(8):1928–1934.

36 Bringolf, R. B., W. G. Cope, S. Mosher, M. C. Barnhart, and D. Shea. 2007. Acute and chronic toxicity of glyphosate compounds to glochidia and juveniles of Lampsilis siliquoidea (Unionidae). Environmental Toxicology and Chemistry 26(10):2094–2100.

4-8 **3. Toxic Effects on Invertebrates:**
Studies have shown that glyphosate can have both a direct toxic effect and an indirect impact due to habitat change on forest-dwelling invertebrates:

- "In the US, a three-year study found that herbivorous insects and ground invertebrates were significantly reduced up to three years after treatment with Roundup in a four-to-five-year-old clear-cut planted with spruce seedlings. The vegetation did not recover over the study period and the authors concluded that the effects on the forest organisms were mainly due to habitat change[37]."[38]
- "A laboratory study found that Roundup exposure caused a decrease in the survival and a decrease in body weight of woodlice[39]."[40]

4. Toxic Effects on Animals and Humans:

4-9 In March 2015, the International Agency for Research on Cancer, part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen.[41] [42]

4-10 According to genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, birth defects, cancer, and

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[37] 172. Cited in WHO, 1994 op cit 7.

[38] Buffin, D., Jewell, T., Health and environmental impacts of glyphosate. 2001:19. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

[39] Mohamed, A.I. et al, 1992. Effects of pesticides on the survival, growth and oxygen consumption of Hemilepistus reaumuri. Trop. Zool. 5, 145-153. Cited in Cox 1995b (Reference 12).

[40] Buffin, D., Jewell, T., Health and environmental impacts of glyphosate. 2001: 19. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

[41] Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

[42] American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

4-10 (cont.)

neurotoxicity."[43]

4-11

"Roundup and other glyphosate herbicide formulations (E.g. AquaMaster, Rodeo, and Roundup Custom) have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including malformations[44]."[45]

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[46], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the shikimate biochemical pathway, which plants have but animals lack.[47] This is false, as glyphosate also affects other pathways that are present in animals and humans.[48]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine disruptors, an effect that can lead to multiple health problems during development and

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43 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

44 Antoniou M, Habib MEM, Howard CV, et al. Teratogenic effects of glyphosate-based herbicides: Divergence of regulatory decisions from scientific evidence. J Env Anal Toxicol. 2012;S4:006. doi:10.4172/2161-0525.S4-006.

45 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

46 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

47 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

48 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

4-11 (cont.)

adult life.

The endocrine disruptive effects are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time."[49]

Study findings regarding the endocrine-disruptive effect of glyphosate and its commercial formulations include the following:

- "Glyphosate herbicide altered hormone levels in female catfish and decreased egg viability. The study concluded that the herbicide is harmful to catfish reproduction. Roundup disrupted production of the steroid hormone progesterone in mouse cells. Glyphosate herbicide was a potent EDC in rats, causing disturbances in reproductive development after exposure during puberty.[50]

- In an in vitro experiment in human cells, glyphosate herbicides prevented the action of androgens, the masculinizing hormones, at levels up to 800 times lower than glyphosate residue levels allowed in some GM crops used for animal feed in the USA. DNA damage was found in human cells treated with glyphosate herbicides at these levels. Glyphosate herbicides disrupted the action and formation of estrogens, the feminizing hormones. The first toxic effects were found at the low dose of 5 ppm and the first endocrine disruption at 0.5 ppm – 800 times less than the 400 ppm level authorized for some animal feeds.[51]

- Roundup herbicide at environmentally relevant exposure levels (down to 0.00023% glyphosate dilution of the commercial formulation) caused the dysregulation of large numbers of genes in human breast cancer cells grown in the laboratory in vitro. Of the 1,550 genes analyzed, expression of 680 was either increased or decreased.

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[49] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[50] Romano RM, Romano MA, Bernardi MM, Furtado PV, Oliveira CA. Prepubertal exposure to commercial formulation of the herbicide Glyphosate alters testosterone levels and testicular morphology. Arch Toxicol. 2010;84:309-317.

[51] Gasnier C, Dumont C, Benachour N, Clair E, Chagnon MC, Séralini GE. Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. Toxicology. 2009;262:184-91. doi:10.1016/j.tox.2009.06.006.

4-11 (cont.)

Roundup was able to replace and work synergistically with estrogen, which is required for growth of the breast cancer cells. This demonstrates the strong potential endocrine disruptive potential of glyphosate in this hormonal system. The authors commented, "There remains an unclear pattern of very complex events following exposure of human cells to low levels of glyphosate, but events surrounding the altered levels of expression of only three genes... out of the entire battery tested, are both complicated and potentially damaging to adult and fetal cells."[52]

- Glyphosate alone increased the proliferation of estrogen-dependent breast cancer cells by estrogenic mechanisms in vitro.[53]

- An in vivo study of Roundup administered to rats in drinking water diluted to 50 ng/L glyphosate equivalence – half of the level permitted in drinking water in the EU[54] and 14,000 times lower than that permitted in drinking water in the USA[55] – resulted in severe organ damage and a trend of increased incidence of mammary tumours in female animals over a 2-year period of exposure.[56] This type of non-linear endocrine disruptive effect of glyphosate and Roundup is not taken into account in safety evaluations, resulting in exposures to the public that could lead to severe illness and reproductive and

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[52] Hokanson R, Fudge R, Chowdhary R, Busbee D. Alteration of estrogen-regulated gene expression in human cells induced by the agricultural and horticultural herbicide glyphosate. Hum Exp Toxicol. 2007;26:747-52. doi:10.1177/0960327107083453.

[53] Thongprakaisang S, Thiantanawat A, Rangkadilok N, Suriyo T, Satayavivad J. Glyphosate induces human breast cancer cells growth via estrogen receptors. Food Chem Toxicol. 2013. doi:10.1016/j.fct.2013.05.057.

[54] Council of the European Union. Council directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Off J Eur Communities. 1998. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:330:0032:0054:EN:PDF.

[55] US Environmental Protection Agency (EPA). Basic information about glyphosate in drinking water. 2014. Available at: http://water.epa.gov/drink/contaminants/basicinformation/glyphosate.cfm#four.

[56] Séralini GE, Clair E, Mesnage R, et al. [RETRACTED:] Long term toxicity of a Roundup herbicide and a Roundup- tolerant genetically modified maize. Food Chem Toxicol. 2012;50:4221-4231.

4-11 (cont.) developmental problems."[57]

4-12 Vulnerable populations, such as the elderly, infants, children, women and people with pesticide allergies are more susceptible at lower doses to the impacts of toxic Glyphosate and Glyphosate Herbicide Formulations. The Draft TPEIR fails to adequately account for such impacts on vulnerable populations.

4-13 To substantiate the above statements about the high, very high and chronic toxicity of Glyphosate, enclosed (Addendum 1) and incorporated into this comment letter is the full text of Chapter 4.1 of the report entitled; "GMO Myths and Truths – Edition 2" by John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil. Chapter 4.1 is entitled; "MYTH: Roundup is a safe herbicide with low toxicity to animals and humans; TRUTH: Roundup has never been tested or assessed for long-term safety for regulatory purposes but independent studies show it is highly toxic to animals and humans."

4-14

B. The Draft TPEIR Fails To Acknowledge That Glyphosate Can Have High Activity And Mobility

1. Glyphosate's Activity and Movement in Soil

Depending on conditions, Glyphosate can have high activity and movement in the soil.

Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. (See **Comment III.B.** of this comment letter regarding the persistence of glyphosate.) Research shows that even when glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[58]

A study entitled; "Hydrogen-bonding Interactions Between the Herbicide

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57 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

58 American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at: http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html

4-14 (cont.)

Glyphosate and Water-soluble Humic Substances" by Piccolo and Celano, has shown that glyphosate can readily desorb from soil particles in some soil types and can be highly mobile in the soil environment.[59] Four soils were used in the study. The key findings included:

- "Levels of adsorption of glyphosate varied in the different soils according to their composition. Least adsorption occurred in the soils containing lower levels of iron oxide. The clay mineral content was also found to be important. Soils containing higher levels of clay minerals adsorbed more glyphosate. However, desorption readily occurred in soil with a high clay mineral but low iron oxide content.
- Large parts of the fixed herbicide can be easily returned to the soil solution.
- The least adsorbing soils desorbed up to 80 per cent of the adsorbed herbicide and the high adsorbing soils released between 15 and 35 percent of the glyphosate adsorbed.
- In soils that are unable to bind with glyphosate long enough for microbial degradation to take place, the herbicide can be extensively mobile in the soil environment.
- Desorbed glyphosate can leach to lower soil layers.
- Glyphosate can bond with water soluble humic substances found in soil solution. Humic substances are the soil components primarily responsible for the mobility of pesticides in soil. Glyphosate can be transported with humic substances to lower soil depths."[60]

Another study entitled "Adsorption of Glyphosate on the Clay Mineral Montmorillonite" by Morilla, Undabytia and Maqueda[61], found: "Adsorption of glyphosate on clay minerals decreased in the presence of copper, due to the formation of glyphosate-copper complexes. The study concluded that in relation to glyphosate release and mobility in soil, it is necessary to take into

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[59] Piccolo, A., Celano, G., 1994. Hydrogen-bonding interactions between the herbicide glyphosate and water-soluble humic substances. Environ. Toxicology and Chemistry 13(11), 1737-1741.
[60] Buffin, D., Jewell, T., Health and environmental impacts of glyphosate. 2001:16. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf
[61] Morillo, E., Undabeytia T. and Maqueda C., 1997. Adsorption of glyphosate on the clay mineral montmorillonite: Effect of Cu(II) in solution and adsorbed on the mineral. Environ. Sci. and Technol. 31(12), 3588-3592.

4-14 (cont.)

account both the soil type and any element in the soil capable of forming complexes with glyphosate"[62]

4-15

2. Glyphosate's Activity and Mobility in Water

During rainfall events, stormwater collects pesticides, such as insecticides, herbicides and fungicides, and transports them to our rivers, lakes, and estuaries. In addition, agricultural practices and landscape maintenance that use these toxic substances can also contaminate runoff and compromise the health of watersheds.[63]

4-16

C. The Draft TPEIR Fails To Acknowledge That Glyphosate Use Has A Significant Risk Of Non-Target Impacts

4-17

Glyphosate can be acutely toxic to non-target plants, including aquatic plants and algae. The effects of this toxicity on natural plant succession alters the ecology of treated areas. In most cases, the plant species diversity will decrease, and along with it, the numbers of insects, mammals and birds utilizing these areas as habitat.[64] [65]

4-18

<u>How Glyphosate Kills Plants</u>**:**

Besides being a patented herbicide, Glyphosate is also a patented mineral chelator, antibiotic, and desiccant. It disrupts plants' metabolic shikimate pathway, which starves plants of essential nutrients and weakens their immune systems. Moreover, Glyphosate's desiccating effects reduce a plant's ability to uptake water. It essentially gives the plants a condition similar to "Aids".

As a powerful antibiotic, Glyphosate also kills beneficial bacteria and other

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[62] Buffin D, Jewell T. Health and environmental impacts of glyphosate. 2001:16. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

[63] National Oceanic and Atmospheric Administration. 2012. Water Quality: How Toxic Runoff Affects Pacific Salmon and Steelhead. National Oceanic and Atmospheric Administration. Available at: http://www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/stormwater_fact_sheet.pdf

[64] Santillo, D.J. et al (1989), "Response of songbirds to glyphosate-induced habitat changes on clear-cut." Journal of Wildlife Management, v. 53 no. 1, 64-71.

[65] Connor, J.F. and McMillan, L.M. (1990), "Winter utilization by moose of glyphosate-treated cutovers." Alces 26:91-103.

4-18 (cont.)

microorganisms in the soil. Beneficial organisms fix atmospheric nitrogen for plants' consumption and are necessary for healthy plant growth.[66] Without these beneficial microorganisms in the soil to compete with and suppress harmful plant soil-borne pathogens, the lethal soil-borne pathogens, such as Fusarium (**see below), take over and ultimately kill the weakened plants.[67] [68]

**Fusarium is a naturally occurring soil fungus that is a plant pathogen. Fusarium invades the roots of plants and either kills the plant outright or prevents normal growth.[69]

4-19

How Glyphosate Kills Non-Target Plants:
Glyphosate doesn't just kill the targeted weeds but kills adjacent beneficial vegetation too. As demonstrated in **Comment II. B.** of this comment letter, glyphosate can readily desorb from soil particles in some soil types and can be highly mobile in the soil environment. Glyphosate travels from the root system of the targeted weed into the soil where it is picked up by adjacent roots of desirable plants and trees, ultimately killing them.

Don Huber PhD and Joe Holland authored an article on glyphosate and plant diseases in the European Journal of Agronomy (2009). The article demonstrates that Glyphosate predisposes plants and trees to disease and toxins. The article shows that glyphosate can increase the spread of Phytophthora (Sudden Oak Death) in oak trees (non-target species) among other plants.

Glyphosate is also a threat to non-target plants as a result of spray drift from target areas. In the US, sub-lethal doses of herbicides have been blamed for reducing winter hardiness and resistance to fungal diseases in trees.[70]

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[66] Carlisle, S.M. and Trevors, J.T. (1988), "Glyphosate in the environment." Water, Air, and Soil Pollution 39:409-420.
[67] Levesque, C.A. (1987), "Effects of glyphosate on Fusarium spp.: its influence on root colonization of weeds, propagule density in the soil, and crop emergence." Can. J Microbiol. Vol 33, pp 354-360.
[68] Sanogo, S., et al,(2000) "Effects of herbicides on Fusarium solani f. sp glycines and development of sudden death syndrome in glyphosate-tolerant soybean." Phytopathology, v. 90 (N1): 57-66.
[69] Levesque, C.A. (1987), "Effects of glyphosate on Fusarium spp.: its influence on root colonization of weeds, propagule density in the soil, and crop emergence." Can. J Microbiol. Vol 33, pp 354-360.
[70] ENDS Report 193, February 1991.

4-19 (cont.)

Studies of the impact of spray drift include:

- "A study of the effects of spray drift of a glyphosate formulation on British species commonly found in nature reserves. The plant species were exposed to spray drift at different distances, wind speeds and application rates (o.5 and 2.2 kg a.i./ha). Death and severe growth suppression occurred at a distance of 2-6 meters from the sprayer. Sub-lethal effects could be detected up to 20 metres away for one species, Prunella vulgaris (self heal). Some species were consistently more sensitive including Digitalis purpurea (foxglove), Centaurea nigra (hard head), Prunella vulgaris (self heal) and Lychnis flos-cuculi (ragged robin). Epinasty (more rapid growth of the upper side of an organ causing for example curling in a leaf) was the most frequent symptom of damage[71]…
- A study looked at species typical to UK woodland margins, hedgerows and field margins. The plant communities were exposed to glyphosate and other herbicides each year for at least three years. The effects of sub-lethal doses were measured on species yield, flowering performance, seed production, seed variability and invasion of new species. All species showed some effects within an eight-metre zone[72]…
- A UK Forestry Commission study into the decline of hedgerow ash found that 19 percent of hedgerow ash showed symptoms of dieback. Trees in rural areas were more badly affected than urban trees. In rural areas, dieback was strongly associated with arable land. The Forestry Commission believes that hormone and glyphosate herbicides commonly affect hedgerow trees and may in part be responsible for the dieback in ash.[73]" [74]

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[71] Marrs R.H., Williams, C.T., Frost, A.J. and Plant, R.A. 1989. Assessment of the effects of herbicide spray drift on a range of plant species of conservation interest. Environ. Pollut 59(1), 71-86. Cited in WHO, 1994 op cit 7.

[72] Marrs, R.H. and Frost, A.J., 1997. A microcosm approach to the detection of the effects of herbicide spray drift in plant communities. J. of Environ.

[73] Forestry Commission. Bulletin 93, Ash dieback. HMSO. London. (Reported in: ENDS Report 193, February 1991.)

[74] Buffin D, Jewell T. Health and environmental impacts of glyphosate. 2001: 16. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

D. The Draft TPEIR Fails To Acknowledge That Glyphosate Is A Patented Desiccant And Its Use Increases The Risk Of Fire

4-20 Glyphosate is a patented desiccant. Its desiccating effects reduce a plant's ability to uptake water. As already mentioned, glyphosate has non-target impacts. Glyphosate use could lead to Sudden Oak Death (see below), Oak Wilt, and a host of Scorch Diseases in which plants can no longer absorb sufficient water and thereby become very flammable. More dry and dead non-target vegetation increases the risk of fire.

4-21 Don Huber PhD and Joe Holland authored an article on glyphosate and plant diseases in the European Journal of Agronomy (2009). The article demonstrates that Glyphosate predisposes plants and trees to disease and toxins. In Maryland parks, glyphosate was found to have a very deleterious effect on Red Oaks (a non-target species). The article shows that glyphosate can increase the spread of Phytophthora (Sudden Oak Death) in oak trees among other plants.

E. Conclusion

4-22 The Draft TPEIR fails to accurately describe glyphosate and commercial glyphosate herbicide formulations and fails to properly disclose and analyze the toxicity, the high activity and mobility, the non-target impacts, and the fire risk of glyphosate and glyphosate herbicide formulations. Failure to identify and analyze key characteristics of and impacts from glyphosate and glyphosate herbicide formulations prevents finding adequate mitigation measures.

III. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO THE ROUTINE TRANSPORT, USE, OR DISPOSAL OF HAZARDOUS MATERIALS

4-23 **A. The Draft TPEIR Fails To Adequately Disclose, Analyze And Mitigate Potentially Significant Impacts Related to the Routine Transport, Use, Or Disposal of Hazardous Materials Because The Mitigation Measure Of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading**

4-23 (cont.)

On Page 252, the Draft TPEIR states; "The project would not create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials due the following controls:" … "Herbicides would be applied according to label requirements that are designed to limit the possibility of hazard through regulation of transport, use, and disposal of herbicides."[75]

The above referenced control is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

For years Roundup products were labeled and advertised as "biodegradable" and "environmentally friendly", with claims it "left the soil clean". The definition of biodegradable is "the chemical dissolution of materials by bacteria or other biological means"[76] The words "biodegradable" and "environmentally friendly" provide significant assurances to consumers and Pest Control Advisors/Technicians.

However, in 1996 the New York Attorney General successfully sued Monsanto (manufacturer and patent holder of Roundup) for falsely advertising Roundup. The company could no longer claim that Roundup was "biodegradable" or "environmentally friendly". They could no longer claim that Roundup was "safer than table salt", "practically nontoxic" to mammals, birds and fish, and would not wash off or leach into the soil. They could no longer advertise that, "Roundup can be used where kids and pets play and breaks down into natural material."

Similarly, in 2009, the French Supreme Court ruled against Monsanto for falsely advertising its Roundup herbicide.[77] [78]

Monsanto's patent for glyphosate expired outside the USA in 1991 and in the US in 2000. Glyphosate is now produced by many companies in the US and

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[75] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 252

[76] Wikipedia, 2015. Biodegradation. Wikipedia. Available at: http://en.wikipedia.org/wiki/Biodegradation

[77] Feridun, K., 2009. Origins: Roundup. Side Dish. Available at: http://www.goindie.com/dish/index.cfm/origins/article/id/95696549-3833-4BE2-89242AEBA8BEC02E

[78] Wikepedia, 2015. Monsanto Legal Cases. Wikepedia. Available at: https://en.wikipedia.org/wiki/Monsanto_legal_cases

4-23 (cont.)

around the world.[79]

4-24

The glyphosate market is concentrated with top four players holding more than 50% share. Some of the key manufacturers of glyphosate include Monsanto Company, Nufarm Ltd., Syngenta AG., DowAgroSciences LLC, E. I. du Pont de Nemours and Company, Zhejiang Xinan Chemical Industrial Group Company, Ltd., Jiangsu Good Harvest-Weien Agrochemical Co., Ltd. and Nantong Jiangshan Agrochemical & Chemicals Co., Ltd. among others.[80]

Only Monsanto is bound by the rulings of the New York Attorney General and the French Supreme Court. The other manufacturers of glyphosate are not bound by the rulings.

Moreover, on April 21, 2015, a new class action lawsuit (Case No: BC 578 942) was filed in the Los Angeles County, California against the Monsanto Corporation. The suit alleges that Monsanto is guilty of false advertising by claiming that glyphosate, the active ingredient in Roundup, targets an enzyme only found in plants and not in humans or animals. Monsanto is accused of deliberate falsification to conceal the fact that glyphosate is harmful to humans and animals.

In the lawsuit, the argument is made that the targeted enzyme, EPSP synthase, is found in the microbiota, which reside in our intestines, and therefore this enzyme is found in humans and animals. It is further stated in the lawsuit that there are many human and animal health problems associated with the disruption of our intestinal microbes.[81]

The complaint for the lawsuit specifically states; “Because it kills-off our gut

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79 Friends of the Earth, 2013. Introducing Glyphosate, the Worlds Biggest Selling Herbicide. Friends of the Earth. Available at: https://www.foeeurope.org/sites/default/files/press_releases/foee_1_introducing_glyphosate.pdf

80 Sustainable Pulse, 2014. Glyphosate Herbicide Sales Boom Powers Global Biotech Industry. Sustainable Pulse. Available at: http://sustainablepulse.com/2014/08/21/glyphosate-sales-boom-powers-global-biotech-industry/#.VVedAhedWpq

81 Swanson, N., 2015. Monsanto Sued in Los Angeles County for False Advertising. Examiner. Available at: http://www.examiner.com/article/monsanto-sued-los-angeles-county-for-false-advertising#

4-24 (cont.)

bacteria, glyphosate is linked to stomach and bowel problems, indigestion, ulcers, colitis, gluten intolerance, sleeplessness, lethargy, depression, Crohn's Disease, Celiac Disease, allergies, obesity, diabetes, infertility, liver disease, renal failure, autism, Alzheimer’s, endocrine disruption, and the W.H.O. recently announced glyphosate is 'probably carcinogenic.”[82]

Photo Exhibit by T. Mathew Phillips, Esq. (Attorney representing Plaintiffs in Class Action lawsuit – Elvis Mirzaie, Edison Mirazie, Romi Mirzaie (Plaintiffs) vs. Monsanto Company (Defendants))

Conclusion

With such a history of false advertising and labeling, the Marin County Open Space District and the TPEIR cannot trust labels of commercial glyphosate herbicide formulations to be accurate and provide adequate and

82 Superior Court of the State of California, County of Los Angeles, 2015. Case No: BC 578 942 CLASS ACTION: Complaint for Damages Preliminary Injunction, and Permanent Injunction; False and Misleading Advertising [B&P Code 17500]. Available at: http://www.monsantoclassaction.org/wp-content/uploads/2015/04/Monsanto-Glyphosate-Class-Action-4.20.2015.pdf

4-24 (cont.)

safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the TPEIR to "apply herbicides according to label requirements" fails to adequately mitigate "the possibility of hazard through regulation of transport, use and disposal of herbicides". Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust application requirements for herbicides.

4-25

In addition, the DRAFT TPEIR fails to identify and disclose the quantities, routes and method of toxic materials (herbicides in specific) being transported on public roadways. This information needs to be listed in detail, in the DRAFT TPEIR. Appropriate citations related to the regulation of transportation of hazardous materials (including transport method requirements) should also be included in the DRAFT TPEIR.

B. The Draft TPEIR Fails To Adequately Disclose, Analyze And Mitigate Potentially Significant Impacts Related to the Routine Transport, Use, Or Disposal of Hazardous Materials Because The Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) and Draft TPEIR Is Inadequate

On Page 252, the Draft TPEIR states; "The Project would not create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials due to the following controls:"…
"Implementation of the BMPs (Best Management Practices) listed in the VBMP would reduce the potential for pollution and hazardous exposure to herbicides."[83]

4-26

However, the control / mitigation measure described above relies on BMP-Invasive Plant-1 "*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*", which is severely flawed in regard to notification and signage procedures.

[83] See Draft TPEIR for the MCOSD VBMP, Pg. 252

4-26 (cont.)

On Page 255, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"…
"All Notices of Herbicide Application must be removed **four days** after the application has been made."[84]

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances.

4-27

Persistence of glyphosate in soil and water**:**
Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. Research shows that even when glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[85]

A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[86] AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days.[87] [88] In water, glyphosate has a long persistence in sediments.

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-

84 See Draft TPEIR for the MCOSD VBMP, Pg. 255
85 American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at: http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html
86 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.
87 World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.
88 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyhosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

4-27 (cont.)

infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[89]. The report reached the following conclusions:

- Half-life in soil of Glyphosate and its metabolite AMPA**:** The half-life of glyphosate in soil was 44 days. The half-life of AMPA in soil was 46 days.
- Half-life in broom leaves that failed to drop to ground: Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites, indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches.

Other records of glyphosate persistence include[90 91]:

- 249 days on Finnish agricultural soils;
- Between 259 and 296 days on eight Finnish forestry sites;
- Between one and three years on 11 Swedish forestry sites;
- 335 days on a Canadian forestry site;
- 360 days on three Canadian forestry sites;
- 12 to 60 days in pond water following direct application;
- Glyphosate residues in pond sediment were found 400 days after direct application;
- More than one year in studies of pond sediments in the US.

"The rate of glyphosate degradation in soil correlates with the respiration rate, an estimate of microbial activity. Glyphosate has been found to inhibit growth (at 50 ppm) of 59% of randomly selected soil bacteria, fungal, actinomycete, and yeast isolates; of nine herbicides tested, glyphosate was the second most toxic."[92] This infers that with extensive glyphosate use, soil microbes are killed which degrade glyphosate, thus slowing degradation and

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89 Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

90 Reviewed by Cox, C., 1995b op cit 12.

91 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyhosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

92 Carlisle, SM and Trevors, JT. Glyphosate in the environment. 1988. Water, Air, and Soil Pollution. 39:409-412.

4-27 (cont.) increasing persistence. Glyphosate is much more persistent in anaerobic soils than aerobic.

4-28 Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

4-29

Conclusion

The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all Notices of Herbicide Application to be removed four days after the application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to more than 22 years! Therefore, the mitigation measure to implement the BMPs listed in the VBMP, which relies on BMP-Invasive Plant-1, fails to mitigate potentially significant environmental impacts related to the routine transport, use or disposal of hazardous materials and such impacts would remain significant.

Instead, the Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels. In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

IV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS AND HAZARDS TO THE PUBLIC OR THE ENVIRONMENT THROUGH REASONABLY FORESEEABLE UPSET AND ACCIDENT CONDITIONS INVOLVING THE RELEASE OF HAZARDOUS MATERIALS INTO THE ENVIRONMENT

4-30

A. The Draft TPEIR Mitigation Measure Of Applying Herbicides

4-30 (cont.)

According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

4-31

On Page 252 the Draft TPEIR states; "The Project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment due to the following controls:"… "Herbicides would be applied according to label requirements that are designed to limit accidental conditions and provide mitigating actions for herbicide handlers to take in the event of an accidental spill during routine transport, use, and disposal of herbicides."[93]

The above referenced control is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

For years Roundup products were incorrectly labeled and advertised as "biodegradable" and "environmentally friendly", with claims it "left the soil clean". The words "biodegradable" and "environmentally friendly" provide significant false assurances to consumers and Pest Control Advisors/Technicians.

As a result, in 1996 the New York Attorney General successfully sued Monsanto (manufacturer and patent holder of Roundup) for falsely advertising Roundup. Similarly, in 2009, the French Supreme Court ruled against Monsanto for falsely advertising its Roundup herbicide.[94] [95]

Moreover, on April 21, 2015, a new class action lawsuit (Case No: BC 578 942) was filed in the Los Angeles County, California against the Monsanto Corporation. The suit alleges that Monsanto is guilty of false labeling and advertising by claiming that glyphosate, the active ingredient in Roundup, targets an enzyme only found in plants and not in humans or animals. Monsanto is accused of deliberate falsification to conceal the fact that glyphosate is harmful to humans and animals.

[93] See Draft TPEIR for the MCOSD VBMP, Pg. 259

[94] Feridun, K., 2009. Origins: Roundup. Side Dish. Available at: http://www.goindie.com/dish/index.cfm/origins/article/id/95696549-3833-4BE2-89242AEBA8BEC02E

[95] Wikepedia, 2015. Monsanto Legal Cases. Wikepedia. Available at: https://en.wikipedia.org/wiki/Monsanto_legal_cases

4-31 (cont.)

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Conclusion

4-32

The Marin County Open Space District and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the Draft TPEIR to “apply herbicides according to label requirements” fails to adequately mitigate “accidental conditions and… the event of an accidental spill during routine transport, use, and disposal of herbicides.” Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust application requirements for herbicides.

4-33

B. The Draft TPEIR Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) And The Draft TPEIR Is Inadequate

On Page 252, the Draft TPEIR states; “The Project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment due to the following controls:”… “Implementation of the BMPs listed in the VBMP would reduce the potential for accidentally released hazardous material to reach the public or sensitive natural resources (BMP-Invasive Plant-1, BMP-Invasive Plant-2) to insignificant levels.”[96]

However, the control / mitigation measure described above relies on BMP-Invasive Plant-1 “*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*”, which is severely flawed in regard to notification and signage procedures.

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[96] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 252

4-34 On Page 255, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"…
"All Notices of Herbicide Application must be removed **<u>four days</u>** after the application has been made."[97]

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances.

<u>Persistence in Soil and Water:</u>
4-35 Please review **Comment III. B.** of this comment letter, which demonstrates that, depending on conditions, glyphosate and its metabolites can have a long persistence in soil, water and sediments. Nomura and Hilton (1977) reported glyphosate half-lives of **<u>up to 22 years</u>** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[98]

4-36 Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

Conclusion

4-37 The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all Notices of Herbicide Application to be removed <u>four days</u> after the application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to <u>more than 22 years</u>! The DRAFT TPEIR ecological exposure calculations (I.e. the levels of exposure that may be expected) are wrong because the DRAFT TPEIR assumes a short life span for glyphosate in the environment. Therefore, the mitigation measure to implement the BMPs listed in the VBMP, which relies on BMP-Invasive Plant-1, fails to mitigate and reduce

[97] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 255
[98] Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

4-37 (cont.)

"the potential for accidentally released hazardous material to reach the public or sensitive natural resources". As a result, the draft TPEIR fails to mitigate potentially significant impacts to the public related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment and such impacts would remain significant.

Instead, the Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels. In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

4-38

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts And Hazards To The Public Or The Environment Through Reasonably Foreseeable Upset and Accident Conditions Involving The Release of Hazardous Materials Into the Environment Because Herbicides Are Allowed To Be Mixed In The Environment

The Draft TPEIR (Page 170, **Mitigation Measure 5.2-1(b)**) prohibits herbicides to be mixed within 100 feet of any waterbody, including wetlands yet still allows them to be mixed and possibly released into the environment greater than 100 feet of any waterbody. Therefore, a risk of Hazardous Materials being released into the environment still exists.

A responsible Best Management Practice (BMP) would prevent the potential release of hazardous materials into the environment due to mixing. Rather than mixing herbicides in the open space environment, mixing should occur off site. This would prevent accidental spills of highly concentrated toxic herbicides requiring immediate remediation in the Open Space environment.

4-39

V. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HAZARDOUS EMISSIONS AND THE POTENTIAL FOR EMISSIONS TO DRIFT TO SCHOOL SITES

4-40

A. The Draft TPEIR Mitigation Measure Of Using Herbicides

According To Product Label Instructions Is Rendered Deficient When Labels Are Incorrect And Misleading

4-40 (cont.)

On Page 252 the TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not volatile and would be used according to product label instructions by trained personnel that would significantly reduce or eliminate the potential for drift to school sites."[99]

The above referenced mitigation measure of using herbicides according to product label instructions is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

For years Roundup products were incorrectly labeled and advertised as "biodegradable" and "environmentally friendly", with claims it "left the soil clean". The words "biodegradable" and "environmentally friendly" provide significant false assurances to consumers and Pest Control Advisors/Technicians.

As a result, in 1996 the New York Attorney General successfully sued Monsanto (manufacturer and patent holder of Roundup) for falsely advertising Roundup. Similarly, in 2009, the French Supreme Court ruled against Monsanto for falsely advertising its Roundup herbicide.[100] [101]

Moreover, on April 21, 2015, a new class action lawsuit (Case No: BC 578 942) was filed in the Los Angeles County, California against the Monsanto Corporation. The suit alleges that Monsanto is guilty of false labeling and advertising by claiming that glyphosate, the active ingredient in Roundup, targets an enzyme only found in plants and not in humans or animals. Monsanto is accused of deliberate falsification to conceal the fact that glyphosate is harmful to humans and animals.

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a history and

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[99] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 252

[100] Feridun, K., 2009. Origins: Roundup. Side Dish. Available at: http://www.goindie.com/dish/index.cfm/origins/article/id/95696549-3833-4BE2-89242AEBA8BEC02E

[101] Wikepedia, 2015. Monsanto Legal Cases. Wikepedia. Available at: https://en.wikipedia.org/wiki/Monsanto_legal_cases

4-40 (cont.) repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Conclusion

4-41 Marin County Open Space and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe use and application instructions. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the TPEIR to "use herbicides according to product label instructions" fails to adequately mitigate hazardous emissions and the potential for emissions to drift to school sites. Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust instructions for herbicides.

4-42 **B. The Draft TPEIR Inaccurately States That None Of The Herbicides Proposed For Use Are Considered Hazardous Substances And No Hazardous Waste Would Be Generated During Herbicide Application**

4-43 On Page 252, the TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not volatile and would be used according to product label instructions by trained personnel that would significantly reduce or eliminate the potential for drift to school sites. None of the herbicides proposed for use are considered hazardous substances according to California Code of Regulations (CCR) Title 8, 339 (Hazardous Substances List). No hazardous waste would be generated during herbicide application."[102]

The above description of the herbicides proposed for use is inadequate and misleading. As demonstrated in **Comment II. A.** of this comment letter, various independent studies demonstrate that glyphosate is highly, very highly and chronically toxic and glyphosate product formulations are even more toxic.

4-44 It is negligent for the TPEIR to only consider classifications of the California Code of Regulations (CCR). In March, 2015, the International Agency for Research on Cancer (IARC), part of the World Health

[102] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 252

4-44 (cont.)

Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen.[103] [104]

The various independent studies outlined in **Comment II. A.**, which demonstrate that glyphosate and glyphosate herbicide formulations are highly and chronically toxic and the IARC's classification of glyphosate as a Group 2A carcinogen establish that glyphosate is a hazardous substance. As such, the TPEIR cannot claim that "no hazardous waste would be generated during herbicide application".[105]

Conclusion

4-45

The TPEIR fails to accurately describe glyphosate and commercial glyphosate herbicide formulations, fails to identify glyphosate and glyphosate herbicide formulations as hazardous substances and fails to properly disclose and analyze the hazardous emissions of glyphosate and glyphosate herbicide formulations and the potential for such emissions to drift to school sites. Failure to identify and analyze impacts from hazardous emissions of glyphosate and glyphosate herbicide formulations prevents finding adequate mitigation measures.

4-46

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Hazardous Emissions And The Potential For Emissions To Drift To School Sites Due To Methods of Application

4-47

Sensitive receptors' inadvertent exposure to hazardous emissions of herbicides can occur depending on the method of application, particularly Rope Wick and Foliar applications, as well as the persistence and drift of products in the environment beyond posted warnings.

For herbicides that can be transmitted through air, like glyphosate, the

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103 Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

104 American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

105 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 252

4-47 (cont.)

potential hazard of sensitive receptors' inadvertent exposure at school sites exists when the herbicides are being used along medians near school sites in the County because they can be stirred up by wind and auto travel and then drift to the schools.

If the pesticides did not present a risk to the public and the environment through either use or accident, then there would be no need for the following goal: "…goal of eliminating the use of pesticides"[106] (IPM Ordinance No. 3521)

On Page 252 the Draft TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not **volatile**…"[107] Therefore, the Draft TPEIR assumes that herbicides would not travel through the air and drift to school sites.

However, a study from the U.S. Geological Survey, entitled "Pesticides in Mississippi Air and Rain: A Comparison Between 1995 and 2007", reveals that Glyphosate and its toxic degradation byproduct AMPA were found in over 75% of the air and rain samples tested from Mississippi in 2007.[108]

4-48

Conclusion

The Draft TPEIR mitigation measures, related to hazardous emissions and the potential for emissions to drift to school sites, fail to disclose the methods of application and falsely presume that using herbicides, such as Glyphosate, will not result in hazardous emissions and be transmitted through the air.

4-49

VI. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, EVALUATE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HUMANS' AND ECOLOGICAL RECEPTORS' EXPOSURE TO HERBICIDES BECAUSE ITS "IMPACT EVALUATION APPROACH" IS BASED ON GENERALIZATIONS, OUTDATED SCIENCE AND INCORRECT INFORMATION

[106] County of Marin Integrated Pest Management Policy and Integrated Pest Management Ordinance No. 3521, adopted by the Board of Supervisors, July 21, 2009.
[107] Draft MCOSD VBMP Draft TPEIR, Pg. 252
[108] Michael S Majewski, Richard H Coupe, William T Foreman, Paul D Capel. Pesticides in Mississippi air and rain: A comparison between 1995 and 2007. Environ Toxicol Chem. 2014 Feb 19. Epub 2014 Feb 19. PMID: 24549493

4-50

A. The Draft TPEIR Mitigation Measure of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

On page 259 under "**Impact Evaluation Approach**", the Draft TPEIR states; "Under most circumstances, following label requirements and PCA and QAC/QAL guidance is sufficient to reduce the magnitude and likelihood of impacts to insignificant levels."[109]

Please review **Comment III. A.** of this comment letter. This comment demonstrates that there is a history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Marin County Open Space and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe use and application instructions. Indeed, the labels may actually be misleading and provide significant false assurances to Pest Control Advisors and Technicians. The mitigation measure of applying herbicides according to label requirements is rendered deficient when labels are incorrect and misleading.

4-51

B. The Draft TPEIR "Impact Evaluation Approach" Fails To Accurately Disclose and Analyze Potentially Significant Impacts of Glyphosate and Glyphosate Herbicide Formulations On Non-Plant Receptors

On Page 259 under "**Impact Evaluation Approach**", the Draft TPEIR states; "In general, the use of herbicides does not pose unacceptable risk to humans and ecological receptors. This is because herbicides are designed to be highly selective for plants. That is, the mechanism of action (i.e. the manner in which herbicide products produce the desired effect in plants) is not shared between plants and non-plant receptors, such as human and animals. For example, the active ingredient of an herbicide may exhibit selective toxicity to plants through selective inhibition of an enzyme found exclusively within plants. This specificity generally renders herbicides practically non-toxic to non-plant organisms and significantly contributes to

[109] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 259

4-51 (cont.)

the safety of their use and reduces the likelihood of adverse impacts."[110]

As discussed above, the above generalization does not apply to glyphosate and glyphosate herbicide formulations. Yet, the Draft TPEIR does not recognize this and treats glyphosate and glyphosate herbicide formulations the same as all other herbicides.

Please review **Comment II** of this comment letter, which demonstrates that glyphosate and glyphosate herbicide formulations are highly toxic to aquatic organisms, amphibians, invertebrates, animals and humans.

Toxic effects of glyphosate and glyphosate herbicide formulations found in studies include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, development and reproductive toxicity, malformations, cancer, and neurotoxicity.

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[111], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the shikimate biochemical pathway, which plants have but animals lack.[112] This is false, as glyphosate also affects other pathways that are present in animals and humans."[113]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine Disruptors, an

110 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 259

111 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

112 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

113 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

4-51 (cont.)

effect that can lead to multiple health problems during development and adult life. The endocrine disruptive effects are most worrying, as they manifest at very low doses (such as at .5 ppm and 50ng/L dose levels, as demonstrated in **Comment II.A.4.** of this comment letter) and can lead to ill health when exposure takes place over long periods of time."[114]

The above facts demonstrate that the generalization made on page 259 under "Impact Evaluation Approach" of the TPEIR that the "mechanism of action is not shared between plants and non-plant receptors, such as human and animals" and "renders herbicides practically non-toxic to non-plant organisms and significantly contributes to the safety of their use and reduces the likelihood of adverse impacts"[115] does not apply to glyphosate and glyphosate herbicide formulations. Yet, the TPEIR fails to acknowledge this.

4-52

Conclusion

As demonstrated above and in **Comment II** of this comment letter, the Draft TPEIR fails to adequately identify and evaluate potentially significant impacts because its "Impact Evaluation Approach" is based on generalizations, outdated science and incorrect information.

4-53

VII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HUMAN RECEPTORS' (APPLICATORS AND PRESERVE USERS) EXPOSURE TO HERBICIDES (IMPACT 5.5-2)

4-54

A. The Draft TPEIR Mitigation Measure Of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

4-55

On page 269, under **Impact 5.5-2**, the Draft TPEIR states; "For human receptors, the impact to applicators was evaluated to be no or less-than-significant impact while **<u>following label requirements</u>**, PCA recommendations, and all pertinent BMPs in the draft VBMP."[116]

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114 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

115 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 259

116 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 269

4-55 The above referenced mitigation measure of "following label requirements" is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a long history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Conclusion

4-56 The Marin County Open Space District and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the Draft TPEIR to "follow label requirements" fails to adequately mitigate impacts related to human receptors' exposure to herbicides. Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust application and use requirements for herbicides.

4-57

B. The Draft TPEIR Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) And The Draft TPEIR Is Inadequate

On page 269, under **Impact 5.5-2**, the Draft TPEIR states; "For human receptors, the impact to applicators was evaluated to be no or less-than-significant impact while following label requirements, PCA recommendations, and **all pertinent BMPs in the draft VBMP.**"[117] The Draft TPEIR emphasizes following Best Management Practice – BMP-Invasive Plant-1.

The Draft TPEIR further states; "For preserve users, the precautionary measures taken by the MCOSD to inform the public by providing notice at the entry to herbicide treatment sites are considered sufficient to significantly reduce or prevent herbicide exposure to preserve users. This

[117] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 269

would be a less-than-significant impact."[118]

4-57 (cont.)

However, the mitigation measures described above for both applicators and preserve users rely on BMP-Invasive Plant-1 "*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*", which is severely flawed in regard to notification and signage procedures.

On Page 269, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"…
"All Notices of Herbicide Application must be removed **four days** after the application has been made."[119]

4-58

Persistence in Soil and Water:
Please review **Comment III. B.**, which demonstrates that, depending on conditions, glyphosate and its metabolites can have a long persistence in soil, water and sediments. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[120]

Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds. When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances

4-59

Conclusion
The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all Notices of Herbicide Application to be removed four days after the

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118 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 269
119 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 269
120 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

4-59 (cont.)

application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to more than 22 years! Therefore, the mitigation measures to implement the BMPs listed in the VBMP, which rely on BMP-Invasive Plant-1, fail to mitigate the potentially significant environmental impacts related to human receptors' (Applicators and Preserve users) exposure to herbicides (Impact 5.5-2) and such impacts would remain significant.

4-60

Instead, the Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels. In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

4-61

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Human Receptors' Exposure of Human Receptors to Herbicides (Impact 5.5-2) Because Volunteers Are Not Trained Applicators or Trained to Conduct Management Activities.

The Draft TPEIR (Page 72 "Community Engagement and Volunteerism") states; "The draft VBMP recommends using volunteers for implementing the vegetation management activities."

The Draft TPEIR does not preclude volunteers from any particular vegetation management activity and does not preclude volunteers from being exposed to herbicides. Yet, vegetation management activities include the use of herbicides, which could be hazardous. Furthermore, volunteers could be exposed to herbicides when they pull contaminated weeds or plant new plants in contaminated soils.

Volunteers are not trained applicators and do not necessarily have in depth knowledge of herbicides. Therefore, exposing volunteers to herbicides could be hazardous.

Without specificity of what vegetation management activities the volunteers would partake in or where the volunteers would conduct such vegetation

4-61 (cont.)

management activities, it is impossible to evaluate whether or not the mitigation measures in the draft TPEIR would reduce the potentially significant impact related to volunteers' exposure to herbicides to less-than-significant.

4-62

VIII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO NON-PLANT ECOLOGICAL RECEPTORS (IMPACT 5.5-1)

The Draft TPEIR (Page 264) identifies **Impact 5.5-1**: For non-plant ecological receptors, six of the 28 application scenarios evaluated would result in a significant impact.

The Draft TPEIR (Page 266) then attempts to mitigate Impact 5.5-1 with **Mitigation Measure 5.5-1**:
"In order to reduce impacts associated with herbicide use from activities related to the continued implementation of the VBMP, the MCOSD shall revise BMP-Invasive Plant-2 as follows:

- BMP-Invasive Plant-2 Limit Herbicide Use within 100 feet of sensitive natural resources. Where possible ensure use of least harmful method to conduct vegetation management (e.g. hand control, mechanical control, cultural controls). <u>Where herbicide treatment within a minimum 100-foot buffer is considered essential to control the invasive species and reduce the threat to sensitive natural resources, the MCOSD **will prepare a treatment program**, as called for in BMP-Sensitive Natural Resources-1 to ensure careful controls are fully implemented and conditions adequately monitored</u>.
- Within the 100-foot buffer zone, herbicide use is limited through either:
    - Avoiding the use of herbicide entirely within the zone, or
    - Restricting herbicide to targeted application methods, such as foliar spot spray applications. Options on the extent, specific herbicides(s), and application method(s) **will be reviewed in the treatment program**, and recommendations made for preferred treatment based on site specific conditions, threats, and benefits to the sensitive natural resource, and latest adaptive management practices…"[121]

[121] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 266

4-62 (cont.)

Mitigation Measure 5.5-1 fails to mitigate Impact 5.5-1 because it defers analysis to a future date. The mitigation measure calls for preparing treatment program(s) in the future and reviewing options on the extent, specific herbicides and application methods in the future. There is no specificity given now about the treatment program(s) or the herbicide application options. Therefore, the public and decision makers are unable to presently determine whether or not Mitigation Measure 5.5-1 would reduce impacts, associated with herbicide use from activities related to the continued implementation of the VBMP, to less-than-significant.

The Draft TPEIR's approach undermines CEQA. The Marin County Open Space District may not defer thorough analyses. "CEQA advances a policy of requiring an agency to evaluate the environmental effects of a project *at the earliest possible stage* in the planning process."[122] The entire point of the CEQA process is to offer the public and the decision makers the opportunity to weigh-in on a project's potentially significant impacts and an agency's proposed measures to mitigate those impacts. It is well-established that CEQA is not meant to be a post hoc rationalization of decisions that have already been made.

4-63

IX. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO WATER QUALITY STANDARDS OR WASTE DISCHARGE REQUIREMENTS ASSOCIATED WITH THE USE OF HERBICIDES AND THEIR DEGRADATION PRODUCTS (IMPACT 5.2-1)

The Draft TPEIR (Page 30) describes **Impact 5.2-1; "5.2-1 Water Quality Standards or Waste Discharge Requirements. –** Herbicide application could occur when rainfall and stormwater runoff could mobilize herbicides and/or their by-products and convey them to ponds, lakes or creeks. This has the potential to be a significant impact on water quality standards as set forth in the NPDES General Permit and the Diazinon and Pesticide Toxicity in Urban Creeks TMDL described in the Bay Basin Plan."[123]

A. The Draft TPEIR Fails To Adequately Mitigate Impact 5.2-1

[122] City of Redlands v. County of San Bernardino (2002) 96 Cal.App.4th 398, 410.
[123] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 30

4-63 (cont.)

Because Mitigation Measure 5.2-1 Incorporates Mitigation Measure 5.5-1 And Mitigation Measure 5.5-1 Defers Analysis

The DRAFT TPEIR attempts to mitigate Impact 5.2-1 by implementing Mitigation Measure 5.2-1. Mitigation Measure 5.2-1 begins by stating "Implement Mitigation Measure 5.5-1".[124]

Please see **Comment VIII** of this comment letter, which illustrates the inadequacy of Mitigation Measure 5.5-1.

4-64

Mitigation Measure 5.5-1 defers analysis**:**
Mitigation Measure 5.5-1 fails to mitigate Impact 5.5-1 because it defers analysis to a future date. The mitigation measure calls for preparing treatment program(s) in the future and reviewing options on the extent, specific herbicides and application methods in the future. There is no specificity given now about the treatment program(s) or the herbicide application options. Therefore, the public and decision makers are unable to presently determine whether or not Mitigation Measure 5.5-1 would reduce impacts, associated with herbicide use from activities related to the continued implementation of the VBMP, to less-than-significant.

4-65

Mitigation Measure 5.5-1 fails to mitigate Impact 5.2-1 for the same reasons it fails to mitigate Impact 5.5-1.

B. The Draft TPEIR's Mitigation Measure 5.2-1 And Mitigation Measure 5.5-1 Fail To Mitigate Potentially Significant Impacts Related To Water Quality Within A 100-Foot Buffer

Mitigation Measure 5.5-1 allows for herbicide treatment within a minimum 100-foot buffer when it is considered essential to control the invasive species and reduce the threat to sensitive natural resources.[125]

However, the Draft TPEIR (page 171) states: "The 100' buffer would provide for substantial degradation or sequestering of any herbicide ingredients or byproducts through both soil, plant/litter and water contact. Herbicides degrade more quickly where the dissolved ingredient comes into contact with soil under both overland flow and soil infiltration scenarios.

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[124] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 30.
[125] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 266.

Moreover, the absorption (i.e. hydrochemical binding) of these ingredients is enhanced as the clay content increases."[126]

4-65 (cont.)

If the 100' buffer is necessary for substantial degradation or sequestering of any herbicide ingredients or byproducts through both soil, plant/litter and water contact, then herbicide usage should not be allowed within the 100' buffer.

The Adopted Basin Plan Amendment issued by the RWQCB (2007) states: "All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species."[127]

4-66

C. The Draft TPEIR's New Best Management Practices (BMPs) Addressing Water Quality Impacts Are Inadequate

The Draft TPEIR (Page 171) states; "The new BMPs addressing water quality impacts would **reduce** the potential for herbicides to migrate through surface water and groundwater to sensitive water bodies." [128]

These potential detrimental effects of migration of unspecified herbicides and their by-products should be **prevented** rather than 'reduced' and monitored after their adverse impact. Additionally the BMPs do not disclose or analyze the characteristics and deleterious effects of specific adjuvants and the degraded products (See **Comment XIII** of this comment letter). Furthermore, as discussed in **Comment II** of this comment letter, glyphosate herbicide formulation labels with aquatic approval may be unreliable.

4-67

X. THE DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO DEGRADED WATER QUALITY AND SUBSTANTIAL ADDITIONAL SOURCES OF POLLUTED RUNOFF (IMPACT 5.2-3)

[126] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 171.
[127] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 168
[128] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 171

4-67 (cont.)

The Draft TPEIR (Page 175) describes **Impact 5.2-3 "Degraded Water Quality and Substantial Additional Sources of Polluted Runoff";** "Section 5.5 Hazards – Herbicide Use presents a semi-quantitative to qualitative risk screening analysis of ecotoxicity for selected plant, insect, and animal receptors for a list of herbicides potentially approved by MCOSD. The results of that analysis indicate that foliar herbicide applications following concentration limits specified on the labels of assess brand name products would result in significant impacts to aquatic-phase amphibian, fish, aquatic invertebrate, terrestrial insect, and preserve user exposures, originating as either ingestion and/or dermal absorption. Given these assessed toxicities, and the potential for wet season herbicide applications within 100 feet of creeks, rivers, ponds, springs and seeps, surface runoff and/or degraded groundwater discharge, project implementation could result in substantial additional sources of polluted runoff reaching these sensitive water resources within the preserve areas. This would be a significant impact."

Mitigation Measure 5.2-1 attempts to reduce the project impact (Impact 5.2-3) on the quality of stormwater runoff by asserting "restrictions on timing, conditions and types of herbicides".[129]

However, the mitigation measure does not address the methods of application or the characteristics or impact of degradation by-products. It does not define when it would be "necessary to secure the expertise of biologists, herbicide specialists and /or water quality professionals to interpret conditions and to determinate risks to specific animal or insect receptors"[130]

In conclusion, the Draft TPEIR fails to adequately address potentially significant impacts related to polluted stormwater runoff.

4-68

XI. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO DABBING AND CUT STUMP APPLICATION OF HERBICIDES

The Draft TPEIR (Page 247) describes the application method used by

[129] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 176
[130] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 176

4-68 (cont.)

MCOSD to apply herbicides called “Cut Stump Application” as follows; “Cut stump applications are highly targeted applications where herbicide is applied with a paint-brush, wick applicator or low volume sprayer to the stump of a cut down tree. To be effective, treatments are typically made shortly (within an hour) after the tree is cut down to prevent the tree’s vascular system from sealing off.”[131]

The TPEIR fails to mention that the “Cut Stump Application” method is also used on tall shrubs with thick stems, like Broom. The TPEIR also fails to mention that dabbing an herbicide with a paint-brush, wick applicator or sponge uses a much higher concentration of an herbicide than spraying.

Don Huber PhD (Emeritus Professor of Plan Pathology at Purdue University) and Bob Streit (Crop, Seed, Technology and Soil remediation Consultant) gave a lecture in 2014 about the risks of using Glyphosate in Marin County, particularly in the Marin Municipal Water District (MMWD) watershed. Both experts examined the MMWD Wildlife Protection and Habitat Improvement Plan and walked through the MMWD watershed. In particular, they examined the invasion of Broom in the watershed. The application technique for controlling Broom, highlighted by MMWD Representatives to Dr. Huber and Mr. Streit, was to cut the stems of the Broom and then sponge dab a glyphosate herbicide formulation to the remaining stumps of the shrub.

Dr. Don Huber explained and Bob Streit agreed that dabbing typically uses a much higher concentration of Glyphosate than spraying. Therefore, when dabbing weeds, the amount of Glyphosate per acre would be similar to the amount typically used when spraying BUT the amount entering the soil at a particular site would be much greater!

When applied to a weed, an herbicide, like Glyphosate and Glyphosate Herbicide Formulations, does not remain on the exterior of the weed but is absorbed into the weed’s tissues and travels down into the root system. The herbicide then travels from the root system of the targeted weed into the soil where it can be picked up by adjacent roots of beneficial non-target plants and trees, ultimately killing them. The more concentrated the herbicide is at a particular site (which results from dabbing and Cut Stump Applications),

[131] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 247

4-68 (cont.)

the greater the impact on neighboring non-target plants and trees.

The Draft TPEIR fails to disclose, analyze and mitigate potentially significant impacts related to high concentrations of herbicides at particular sites where the herbicides would be applied using the application method of dabbing and Cut Stump Application.

4-69

XII. THE DRAFT TPEIR FAILS TO SATISFY CEQA REQUIREMENTS BECAUSE IT IMPROPERLY DEFERS THE DISCLOSURE, ANALYSIS AND MITIGATION OF POTENTIALLY SIGNIFICANT IMPACTS

The Marin County Open Space District may not defer thorough analyses. "CEQA advances a policy of requiring an agency to evaluate the environmental effects of a project *at the earliest possible stage* in the planning process."[132]

CEQA requires the County to adopt feasible mitigation measures that will substantially lessen or avoid the Project's potentially significant environmental impacts.[133] A public agency may not rely on mitigation measures of uncertain efficacy or feasibility.[134] "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.[135] Mitigation measures must be fully enforceable through permit conditions, agreements or other legally binding instruments.[136]

Yet, in order to mitigate numerous potentially significant environmental impacts, the DRAFT TPEIR recommends mitigation measures that would be designed in the future. Designing and determining the specifics of a mitigation measure in the future does not allow the public or decision makers to evaluate the measures now and presently determine whether or not they are feasible.

4-70

A. The Draft TPEIR Fails To Satisfy CEQA Requirements Because

132 City of Redlands v. County of San Bernardino (2002) 96 Cal.App.4th 398, 410.
133 Pub. Resources Code, §§ 21002, 21081(a).
134 Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692, 727.
135 CEQA Guidelines, § 15364.
136 CEQA Guidelines, § 15126.4(a)(2).

4-70

It Improperly Defers The Analysis And Mitigation Of Potentially Significant Impacts Related To Special-Status Species, Sensitive Natural Communities, Plus Wetlands And Other Waters

The Draft TPEIR (Pg. 45, Section 5.1 "**Biological Resources**") lists the TPEIR's major conclusions and states; "Management activities implemented consistent with the VBMP could result in significant impacts to special-status species, sensitive natural communities, plus wetlands and other waters." [137]

One of the mitigation measures recommended to reduce the identified impacts to a less-than-significant level is the "preparation of a treatment program where management activities would occur within a minimum 100 foot buffer of sensitive natural resources. The treatment program would evaluate options for treatment and risk to sensitive natural resource, define a preferred treatment plan, identify controls for avoiding and minimizing potential adverse effects on the sensitive natural resource and include requirements for construction and post-construction monitoring. Where necessary, compensatory mitigation for unavoidable adverse effects on sensitive natural resources would be required."[138]

The above mitigation measure is inadequate. As described, the treatment program is to be prepared in the future, thereby disallowing any ability to evaluate its adequacy now. There is no specificity about how treatment program and controls would accomplish a less-than-significant impact especially when activities are allowed to occur within the 100' buffer. There is no clarity as to how or whether compensation would/can be made and there is admission of potential unavoidable adverse impacts if management activities are conducted.

4-71

B. The Draft TPEIR Fails To Satisfy CEQA Requirements Because It Improperly Defers The Disclosure, Analysis and Mitigation Of Potentially Significant Impacts Related to Herbicide Products Selected In The Future

The Draft TPEIR (Page 257, "**Application Scenarios**") states; "In addition to the products analyzed, the results of this screening analysis were

[137] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 45
[138] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 45

4-71 (cont.)

considered equally applicable to any substantially similar product that the MCOSD may wish to use. Substantially similar products are products that are considered sufficiently similar in composition and methods of application such that the risk results generated for one product are considered equally relevant to the use of any other product sharing one or more substantially similar features. Substantial similarity between two products may be concluded **based on one** or more of the following features:

- Similar product formulation including similar or identical active and inert ingredients and percent composition thereof;
- Similarities in the methods of application, including equipment, rates, location, and timing;
- Similarities in use or lack of use of adjuvants."[139]

The Draft TPEIR's method for determining whether or not two products are similar would allow a more highly toxic formulation or more powerful adjuvants to be used with a different product name or producer as long as the method of application is the same.

Furthermore, selecting herbicides in the future precludes the ability to adequately disclose, analyze and mitigate potentially significant environmental impacts related to the herbicides now.

4-72

Conclusion

The Draft TPEIR's approach undermines the entire point of the CEQA process -- to offer the public and the decision makers the opportunity to weigh-in on a project's potentially significant impacts and an agency's proposed measures to mitigate those impacts. It is well- established that CEQA is not meant to be a post hoc rationalization of decisions that have already been made. "If post-approval environmental review were allowed, EIR's would likely become nothing more than post hoc rationalizations to support action already taken."[140]

4-73

XIII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO ADJUVANTS

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139 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 257

140 Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 394.

4-73 (cont.)

The Draft TPEIR fails to identify, analyze and mitigate potentially significant impacts related to adjuvants – the solvents, preservatives, surfactants and other substances that manufacturers add to pesticides. Yet, adjuvants can be extremely toxic by themselves and dramatically amplify the toxicity of the main active ingredient of an herbicide. Complete herbicide formulations are many times more toxic than their isolated active ingredients.

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[141]"[142] The "GMO Myths and Truths" report referred to the in vitro study entitled; "Major Pesticides Are More Toxic to Human Cells Than their Declared Active Principles"[143] by Mesnage, Defarge, Vendomois, and Seralini. The study tested the following pesticides: Glyphosate, isoproturon, fluroxypyr, pirimicarb, imidacloprid, acetamiprid, tebuconazole, epoxiconazole, and prochloraz constitute, respectively, the active principles of 3 major herbicides, 3 insecticides, and 3 fungicides. The in vitro study also found that "Chronic tests on pesticides may not reflect relevant environmental exposures if only one ingredient of these mixtures is tested alone."

"Commercial glyphosate herbicide formulations contain extra added

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141 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955666/

142 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

143 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955666/

4-73 (cont.)

ingredients (adjuvants) and are more toxic than glyphosate alone."[144] "The added ingredients (adjuvants) are toxic[145] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[146] [147] [148],,[149]

In June 2009, Scientific American published an article by Crystal Gammon and Environmental Health News entitled; "Weed-Whacking Herbicide Proves Deadly to Human Cells". The article is about a 2008 research study by Nora Benachour and Gilles-Eric Seralini, molecular biologists at University of Caen, France, entitled; "*Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells*"[150]. Benachour and Seralini "found that Roundup's inert ingredients amplified the toxic effect on human cells—even at concentrations much more diluted than those used on farms and lawns."[151]

POEA (polyethoxylated tallowamine) is a surfactant, or detergent, derived from animal fat. It is added to Roundup and other herbicides to help them penetrate plants' surfaces, making the weed killers more effective.

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144 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

145 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

146 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105. doi:10.1021/tx800218n.

147 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33. doi:10.1002/ps.539.

148 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

149 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

150 Benachour, N. Seralini, G. Glyphosate Formulations Induce Apoptosis and Necrosis in Human Ubilical, Embryonic, and Placental Cells. 2008. American Chemical Society. Journal Chemical Research in Toxicology (Jan. 2009). Available at: http://pubs.acs.org/doi/abs/10.1021/tx800218n

151 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

4-73 (cont.)

According to Crystal Gammon, "Researchers Benachour and Seralini tested four different Roundup formulations, all containing POEA and glyphosate at concentrations below the recommended lawn and agricultural dose. They also tested POEA and glyphosate separately to determine which caused more damage to embryonic, placental and umbilical cord cells."[152]

Seralini's team studied multiple concentrations of Roundup, which "ranged from the typical agricultural or lawn dose down to concentrations 100,000 times more dilute than the products sold on shelves. The researchers saw cell damage at all concentrations."[153]

Benachour and Seralini demonstrated that "Glyphosate, POEA and all four Roundup formulations damaged all three cell types (embryonic, placental and umbilical cord cells). Umbilical cord cells were especially sensitive to POEA. Glyphosate became more harmful when combined with POEA, and POEA alone was more deadly to cells than glyphosate." – a finding the researchers call "astonishing."[154]

"This clearly confirms that the inert ingredients in Roundup formulations are not inert," wrote Benachour and Seralini, "Moreover, the proprietary mixtures available on the market could cause cell damage and even death at the residual levels found on Roundup-treated crops, such as soybeans, alfalfa and corn, or lawns and gardens."[155]

Similarly, the study entitled; *"Differential Effects of Glyphosate and Roundup on Human Placental Cells and Aromatase"* by Sophie Richard, Safa Moslemi, and Gilles-Eric Seralini (June 2005) noted that: "Surprisingly, Roundup is always more toxic than its active ingredient

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152 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

153 Gammon, C. 2009. Weed killer kills human cells. Study intensifies debate over 'inert' ingredients. Environmental Health News. Available at: http://www.environmentalhealthnews.org/ehs/news/roundup-weed-killer-is-toxic-to-human-cells.-study-intensifies-debate-over-inert-ingredients

154 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

155 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

4-73 (cont.)

(glyphosate)"… and that "…the presence of Roundup adjuvants enhances glyphosate bioavailability and/or bioaccumulation."[156]

4-74

Conclusion

Adjuvants have been proven to be extremely toxic by themselves and to dramatically amplify the toxicity of the main active ingredient of an herbicide. Complete herbicide formulations are up to 1000 times the toxicity of their isolated active ingredients.

MCOSD must return with a revised Draft TPEIR that discloses, analyzes, and mitigates potentially significant impacts related to the adjuvants of all the herbicides proposed to be used in MCOSD lands. Such disclosure, analysis and mitigations should pertain to each adjuvant by itself and also in combination with other adjuvants and with the main active ingredients of the proposed herbicides. In addition, since multiple herbicides could be applied to the same or adjacent locations, the potential significant impacts related to the combination of the various proposed herbicide formulations should also be addressed.

4-75

XIV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE, AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO POTENTIAL SECONDARY ADVERSE HEALTH IMPACTS CAUSED BY THE USE OF GLYPHOSATE AND GLYPHOSATE HERBICIDE FORMULATIONS

The DRAFT TPEIR fails to consider the potential secondary adverse health impacts related to the loss of amphibian and reptile populations due to the use of Glyphosate and Glyphosate Herbicide Formulations.

Glyphosate use could increase the risk of West Nile Virus: Research has shown that Glyphosate kills tadpoles and frogs. Since those amphibians eat mosquito larvae, use of Glyphosate, due its harm to those amphibians, could significantly increase the risk of West Nile Virus.[157]

Glyphosate use could increase the risk of Lyme Disease:

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156 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15929894

157 Richard A. Relyea, PhD. Ecological Applications, vol.15, No.2, 2005

4-75 (cont.)

According to Jacob Leone ND reporting to the Marin Health Council on March 25, 2014, Lyme disease is endemic to California and Marin County. Regarding epidemiology, he reported that there is greater incidence of Lyme disease in this country than HIV or Breast Cancer.

An article entitled; “Lizard, Tick, Lyme Disease Study Yields Surprise” by David Perlman stated; "The tiny black-legged ticks, abundant throughout the woods of Northern California, carry microbes that can cause Lyme disease in humans they bite. The common Western fence lizards eat those ticks by the millions. Wherever the lizards abound, the population of disease-carrying ticks would be low. That's what scientists have believed. And the smaller the tick population, the lower the risk of Lyme disease. Fewer lizards should result in more of the dangerous ticks. Western fence lizards carry a protein in their blood that kills the Borrelia bacteria, which cause Lyme disease. When the ticks feed on the lizards' blood, the protein cleanses their bodies of the bacteria, so their annoying bites no longer pose a Lyme disease risk."[158]

“In 1998 it was discovered that when a Western black-legged tick feeds on a Western fence lizard, the Lyme disease causing bacteria, *Borrelia Borgdorferi*, is killed. The tick lives but its blood is cleansed of the *Borrelia* bacteria, so its next bite becomes more of a nuisance than a threat to one's health.” “In areas with Western Fence Lizards, about 5% of ticks carry the disease, while in other areas 50% of ticks harbor the disease.”[159]

In a study on the impact of glyphosate formulations with POEA on Skinks, a type of lizard, sprint speed was slower.[160] Sprint speed is an important predictor of lizard health and survival as lizards with slow sprint speeds find it harder to capture prey and escape predators.[161]

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158 Perlman, D., Feb. 22, 2011. Lizard, Tick, Lyme Disease Study Yields Surprise. SF Gate

159 Website of Hastings, a biological Field Station of the University of California. Available at: http://www.hastingsreserve.org/

160 Carpenter, J. K., 2013. Evaluating the effect of glyphosate formulations on the New Zealand common skink (Oligosoma polychroma) (Honours thesis). Victoria University of Wellington, Wellington.

161 Miles, D. B., 2004. The race goes to the swift: fitness consequences of variation in sprint performance in juvenile lizards. Evolutionary Ecology Research, 6(1), 63- 75.

4-75 (cont.) MCOSD should return with a DRAFT TPEIR that evaluates the Project's potential secondary adverse health impacts, including West Nile Virus and Lyme Disease, related to the loss of amphibian and reptile populations due to the use of Glyphosate and Glyphosate Herbicide Formulations.

4-76 **XV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT <u>CUMULATIVE</u> IMPACTS RELATED TO HERBICIDE USE**

A. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant <u>Cumulative</u> Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicides Degrade Rapidly

The Draft TPEIR (Page 364) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: herbicide degradation…"[162]

"**Herbicide Degradation**: Past herbicide use is unlikely to contribute significantly to adverse cumulative impact as **herbicides degrade rapidly** in the environment."[163]

4-77 However, the above Draft TPEIR statement pertaining to herbicide degradation is false in regard to Glyphosate, Glyphosate Herbicide Formulations and Glyphosate's metabolites.

<u>Persistence of glyphosate in soil and water</u>**:**
Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. Research shows that even when glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[164]

A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment. Nomura

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162 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 364
163 See Draft TPEIR for the Draft MCOSD VBMP, Pg. 364
164 American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at: http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html

and Hilton (1977) reported glyphosate half-lives of **<u>up to 22 years</u>** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[165] AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days.[166] [167] In water, glyphosate has a long persistence in sediments.

4-77

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[168]. The report reached the following conclusions:

- Half-life in soil of Glyphosate and its metabolite AMPA**:** The half-life of glyphosate in soil was 44 days. The half-life of AMPA in soil was 46 days.
- Half-life in broom leaves that failed to drop to ground: Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites, indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches.

Other records of glyphosate persistence include[169] [170]:

- 249 days on Finnish agricultural soils;
- Between 259 and 296 days on eight Finnish forestry sites;

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165 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

166 World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

167 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyhosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

168 Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

169 Reviewed by Cox, C., 1995b op cit 12.

170 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyhosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

4-77 (cont.)

- Between one and three years on 11 Swedish forestry sites;
- 335 days on a Canadian forestry site;
- 360 days on three Canadian forestry sites;
- 12 to 60 days in pond water following direct application;
- Glyphosate residues in pond sediment were found 400 days after direct application;
- More than one year in studies of pond sediments in the US.

"The rate of glyphosate degradation in soil correlates with the respiration rate, an estimate of microbial activity. Glyphosate has been found to inhibit growth (at 50ppm) of 59% of randomly selected soil bacteria, fungal, actinomycete, and yeast isolates; of nine herbicides tested, glyphosate was the second most toxic."[171] This infers that with extensive glyphosate use, soil microbes are killed which degrade glyphosate, thus slowing degradation and increasing persistence. Glyphosate is much more persistent in anaerobic soils than aerobic.

As demonstrated above, glyphosate, glyphosate herbicide formulations and glyphosate's metabolites can persist for a very long time. Under certain conditions, Glyphosate can persist for longer than 22 years!

Therefore, the TPEIR fails to acknowledge that herbicides like glyphosate and its metabolites may NOT degrade rapidly but rather could degrade very slowly. Because of this potential slow degradation rate, environmental concentrations of glyphosate and its metabolites may remain for long periods. The TPEIR further fails to acknowledge that herbicides considered in the VBMP (particularly glyphosate, glyphosate herbicide formulations and related metabolites) are likely to be exposed to sensitive receptors and accumulate in the environment. The TPEIR fails to acknowledge that past herbicide use could contribute significantly to adverse cumulative impacts.

4-78

B. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant Cumulative Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicide Applications Do Not Overlap In Location and Time

[171] Carlisle, SM and Trevors, JT. Glyphosate in the environment. 1988. Water, Air, and Soil Pollution. 39:409-412.

4-78 (cont.)

The Draft TPEIR (Page 365) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: … localized nature of herbicide applications…"[172]

"**Localized Nature of Herbicide Applications**: In addition to natural degradation, past, present, and future herbicide use is unlikely to contribute significantly to a significant adverse cumulative impact due to the localized nature of herbicide applications. Invasive plant treatment areas are not usually contiguous or **overlapping in location and time**. This lack of overlap significantly reduces the likelihood that multiple herbicide applications would have a cumulative contribution towards an impact." [173]

However, as discussed above in **Comment XIV. A.** of this comment letter, the above Draft TPEIR statement pertaining to the localized nature of herbicide applications is false in regard to Glyphosate and Glyphosate Herbicide Formulations due to their potential to persist in soil.

4-79

<u>Persistence in Soil and Water:</u>
Please review **Comment XIV. A.** of this comment letter (above), which demonstrates that, depending on conditions, glyphosate and its metabolites can have a long persistence in soil, water and sediments. Nomura and Hilton (1977) reported glyphosate half-lives of **<u>up to 22 years</u>** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[174]

As demonstrated above, glyphosate, glyphosate herbicide formulations and glyphosate's metabolites can persist for a very long time. Under certain conditions, Glyphosate can persist for longer than 22 years!

At numerous preserves (E.g. the Ring Mountain Preserve), the MCOSD has applied glyphosate in the same location each year for contiguous years. Since glyphosate and glyphosate's metabolites can persist for a year or multiple years, depending on conditions, such repeated yearly applications of glyphosate or glyphosate herbicide formulations could result in the applications overlapping in location and time. This overlap significantly

[172] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 365
[173] See Draft TPEIR for the Draft MCOSD VBMP, Pg. 365
[174] Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

4-79 (cont.)

increases the likelihood that multiple herbicide applications would accumulate and have a cumulative contribution towards an impact.

The Draft TPEIR fails to recognize the long persistence of glyphosate, glyphosate herbicide formulations, and glyphosate's metabolites. The Draft TPEIR fails to recognize that repeated yearly applications of glyphosate and glyphosate formulations could result in applications overlapping in location and time. Therefore, the Draft TPEIR fails to adequately disclose, analyze, and mitigate potentially significant cumulative impacts related to herbicide use.

4-80

Thus, the DEIR must assess the cumulative effects of repeat herbicide applications in an area that still contains herbicide residues from the prior application, thereby contributing to cumulative exposures and toxicities. Prior to completion of the EIR, a list of all repeat application sites needs to be compiled. Then a sampling survey should be conducted on the sites, testing the concentrations of herbicides in the soil and nearby surface water, and possibly groundwater. The list of repeat sites, number of times herbicides have been applied, the years of application and amounts if known, as well as the data derived from the sampling survey should be provided to the public at the soonest possible time. All data sets and repeat site information should be included in the DRAFT TPEIR with professional evaluation of the toxicity, environmental and health impacts of the data.

4-81

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant Cumulative Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicide Applications Are Low In Toxicity And That The Mechanism of Action Of Herbicides Would Not Impact Non-Plant Receptors Such As Humans and Animals

The TPEIR (Page 365) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: … Low Toxicity of Herbicides to Animals and Humans…"[175]

"**Low Toxicity of Herbicides to Animals and Humans**: Another factor reducing the likelihood of impact is the low toxicity and high specificity of

[175] See Draft TPEIR of the Draft MCOSD VBMP, Pg. 365

4-81 (cont.)

herbicides. In general, the mechanisms of action of herbicides tend to be highly selective. That is, the mechanism of action is not shared between plants and non-plant receptors such as humans and animals. For example, the active ingredient of an herbicide may exhibit selective toxicity to plants through selective inhibition of an enzyme found only in plants. This specificity generally renders herbicides practically non-toxic to non-plant organisms and significantly reduce the likelihood of adverse cumulative impacts resulting from repeated or aggregate exposure to herbicides."[176]

However, the above TPEIR statement pertaining to the toxicity of herbicides to animals and humans is false in regard to Glyphosate and Glyphosate Herbicide Formulations.

4-82

1. The Draft TPEIR Fails To Acknowledge That Glyphosate Is Highly And Chronically Toxic And Commercial Glyphosate Herbicide Formulations Are More Toxic

Please review **Comment II** of this comment letter, which demonstrates that glyphosate and glyphosate herbicide formulations are highly toxic to aquatic organisms, invertebrates, animals and humans.

Independent studies show that glyphosate, the active ingredient in glyphosate herbicide formulations identified for use in the Vegetation and Biodiversity Management Plan (AquaMaster, Rodeo, and Roundup Custom), is highly, very highly and chronically toxic.

According to genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[177] "The added ingredients (adjuvants) are toxic[178] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[179 180 181,,182]

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176 See Draft TPEIR of the Draft MCOSD VBMP, Pg. 365

177 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

178 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

179 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105.

4-82 (cont.)

"In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[183],,[184]

4-83

2. The Draft TPEIR Fails To Acknowledge That Glyphosate And Glyphosate Herbicide Formulations Are Highly And Chronically Toxic To Animals And Humans:

In March 2015, the International Agency for Research on Cancer, part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen.[185] [186]

According to genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage

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doi:10.1021/tx800218n.

180 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33. doi:10.1002/ps.539.

181 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

182 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

183 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691.

184 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

185 Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

186 American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

4-83 (cont.)

to DNA, developmental and reproductive toxicity, birth defects, cancer, and neurotoxicity."[187]

"Roundup and other glyphosate herbicide formulations (E.g. AquaMaster, Rodeo, and Roundup Custom) have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including malformations[188]."[189]

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[190], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the shikimate biochemical pathway, which plants have but animals lack.[191] This is false, as glyphosate also affects other pathways that are present in animals and humans.[192]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine disruptors, an

187 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

188 Antoniou M, Habib MEM, Howard CV, et al. Teratogenic effects of glyphosate-based herbicides: Divergence of regulatory decisions from scientific evidence. J Env Anal Toxicol. 2012;S4:006. doi:10.4172/2161-0525.S4-006.

189 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

190 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

191 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

192 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

4-83 (cont.)

effect that can lead to multiple health problems during development and adult life.

The endocrine disruptive effects are most worrying, as they manifest at very low doses (such as .5 ppm and 50ng/L as shown in **Comment II.A.4.** of this comment letter) and can lead to ill health when exposure takes place over long periods of time."[193]

The above evidence demonstrates that glyphosate and glyphosate herbicide formulations are highly, very highly and chronically toxic to non-plant organisms and that there is high likelihood of adverse cumulative impacts resulting from repeated and aggregate exposure to herbicides. Therefore the Draft TPEIR's assertion that "the low toxicity of herbicides to humans and animals reduces the potential for significant cumulative impacts from the use of herbicides"[194] is false.

D. Conclusion

4-84

Contrary to the Draft TPEIR's conclusion, based on the above, significant cumulative adverse impacts related to herbicide use would remain **significant**. The Draft TPEIR fails to adequately disclose, analyze and mitigate potentially significant cumulative impacts related to herbicide use.

4-85

XVI. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE, AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO PESTICIDE USE DUE TO THE MARIN COUNTY OPEN SPACE DISTRICT (MCOSD) OVERSEEING PEST MANAGEMENT FOR MARIN COUNTY OPEN SPACE DISTRICT LANDS WHILE NOT BEING SUBJECT TO THE MARIN COUNTY IPM ORDINANCE NO. 3521

The Marin County Parks coordinates the Integrated Pest Management (IPM) Program for the County. In 1983, Marin County developed an IPM Policy. The IPM policy and an associated IPM Ordinance (County Ordinance No. 3521) were subsequently adopted by the Marin County Board of Supervisors

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193 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

194 See Draft TPEIR of the Draft MCOSD VBMP, Pg. 365

4-85 (cont.)

in 1998 and amended in 2013. The IPM policy governs and guides the control of invasive plants and pests on property owned, managed and leased by the County. The policy explicitly states it is "the purpose and intent of policy to ensure effective pest management… with the goal of eliminating the use of pesticides."[195] The County's IPM Ordinance No 3521 is used as a model to guide the MCOSD practices **BUT the MCOSD is <u>not</u> subject to the ordinance or the recommendations of the IPM Commission.** [196]

This could create significant impacts because the MCOSD is not required to follow the IPM ordinance adopted by public representatives. That allows the MCOSD staff to make decisions independent of public input and requirements, which can affect disclosure, analysis and use of hazardous substances that could potentially adversely impact human's and other species' health, habitats and resources, such as water, that constitute our open space environment.[197]

4-86

XVII. THE DRAFT TPEIR FAILS TO CONSIDER AN ALTERNATIVE WHICH INCLUDES AN HERBICIDE-FREE APPROACH TO VEGETATION MANAGEMENT

Under CEQA, a lead agency is required to consider a reasonable range of alternatives to the project, particularly to examine whether there are alternatives that would potentially avoid the significant impacts of the proposed project. Such alternatives should include an herbicide-free approach to vegetation management.

XVIII. CONCLUSION

The DRAFT Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (TPEIR) cannot be relied on to approve the Project. The Marin County Open Space District must prepare a revised TPEIR that adequately analyzes the Project's potentially significant impacts.

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195 County of Marin Integrated Pest Management Policy and Integrated Pest Management Ordinance No. 3521, adopted by the Board of Supervisors, July 21, 2009.
196 See Draft TPEIR of the Draft MCOSD VBMP, Pg. 162
197 Marin County. Marin County Environmental Impact Review Guidelines – Appendix N. Pg. 250, Pg. 251

4-87 As it stands, the DRAFT TPEIR is a woefully inadequate CEQA document. The DRAFT TPEIR's conclusions are not supported by substantial evidence and current science. The DRAFT TPEIR fails to adequately disclose, analyze, and mitigate the Project's potentially significant impacts with respect to herbicides. 4-88 The DRAFT TPEIR fails to consider a reasonable range of alternatives to the project, particularly to examine alternatives that would potentially avoid the significant impacts of the Project. 4-89 The DRAFT TPEIR fails to demonstrate how the Marin County IPM Ordinance (No. 3521) goal of "eliminating the use of pesticides" in the County would be achieved.

4-90 The Marin County Open Space District cannot approve the Project until an adequate TPEIR is prepared and circulated for public review and comment. Furthermore, substantial evidence shows that to protect the health and safety of non-target vegetation, aquatic organisms, amphibians, invertebrates, animals and humans, glyphosate and glyphosate herbicide formulations should be banned from use in Marin County Open Space District lands.

Very truly yours,

/s/

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/s/

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ADDENDUM 1

Chapter 4.1 of the report entitled; “GMO Myths and Truths – Edition 2” by John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil.

4.1 Myth: Roundup is a safe herbicide with low toxicity to animals and humans

Truth: Roundup has never been tested or assessed for long-term safety for regulatory purposes but independent studies show it is highly toxic to animals and humans

Myth at a glance

Claims that Roundup is safe are misleading. Independent studies show that glyphosate, the presumed active ingredient of Roundup, is toxic. Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone.

Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, birth defects, cancer, and neurotoxicity.

Roundup and other glyphosate herbicide formulations have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including malformations.

The endocrine disruptive effects of glyphosate and Roundup are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time.

The GMO industry claims that glyphosate is non-toxic to animals and humans because they lack the shikimate biochemical pathway present in plants. Thisis false, as glyphosate also affects other pathways that are present in animals and humans.

Claims that the Roundup used on GM Roundup Ready crops replaces more toxic herbicides are misleading. The toxicity of Roundup and glyphosate has been underestimated, and the failure of Roundup Ready technology dueto resistant weeds has resulted in farmers using mixtures of herbicides to control weeds. The industry has responded by developing GM crops that tolerate other, potentially even more toxic herbicides, such as 2,4-D, an ingredient of Agent Orange.

GMO Myths and Truths, Page 205

Roundup, the herbicide used on most GM crops, is often claimed to be safe by industry- linked sources.[1] But these claims are based on outdated and largely unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization.[1] The regulatory tests focus only on glyphosate because it is presumed to be the "active ingredient" in Roundup.

The problem with testing glyphosate alone is that Roundup and other commercial glyphosate herbicide formulations have been found in studies to be far more toxic than the isolated supposed "active ingredient" glyphosate. This is logical, since the added ingredients in commercial herbicide formulations, called adjuvants, are included specifically to increase the toxicity of the supposed "active ingredient" to the weeds.

Even glyphosate alone has been found to be more toxic than claimed by industry and regulators, based on data from industry's own studies.[2]

Roundup and other formulations as sold and used have never been tested by industry for long-term toxicity for regulatory purposes prior to being marketed. Neither have regulators required that the formulations be tested at low, realistic doses over long periods of time to see whether they are endocrine (hormone) disruptors.

It has been left to independent scientists to carry out toxicity studies on the formulations after they were released onto the market – and after millions of people have been exposed. The results are concerning. Toxic effects found in these studies include disruptionof hormonal systems, damage to DNA, developmental and reproductive toxicity, malformations, cancer, and neurotoxicity.

Key studies showing toxic effects of glyphosate and Roundup

Studies in human cell lines in vitro and in animals, as well as in human epidemiological and clinical studies, have shown that Roundup and glyphosate have serious toxic effects. In many cases effects are seen at realistic exposure levels. Below are some of the findings.

Adjuvants in Roundup are toxic and increase toxicity of glyphosate

The added ingredients (adjuvants) in Roundup are themselves toxic[3] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[4,5,6]

Adjuvants are widely found in the environment, so people and animals are likely to be exposed to them. For example, the half-life of the Roundup adjuvant POEA (21–42 days) is longer than that of glyphosate alone (7–14 days) in aquatic environments.[7]

Roundup more toxic than glyphosate

In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation

GMO Myths and Truths, Page 206

compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[8]

This principle has been confirmed by experiments in living mammals. An in vivo study in pigs showed that the adjuvant POEA and commercial glyphosate herbicide formulations were toxic and lethal to the pigs, whereas glyphosate alone had no such effects.[9] An in vivo study in rats showed that POEA and Roundup formulations containing POEA were more toxic than glyphosate alone.[10]

Damage to DNA

Glyphosate herbicides altered cell cycle checkpoints in sea urchin embryos by interfering with the DNA repair machinery. Cell cycle dysfunction was seen from the first cell division in the sea urchin embryos.[11,12,13,14] The failure of cell cycle checkpoints is known to lead to genomic instability and cancer in humans.

Glyphosate and its main metabolite AMPA have been found to cause irreversible damage to DNA in human cells in vitro and in mice in vivo.[15,16] Such damage to DNA may increase the risk of cancer and birth defects. AMPA damaged DNA in human cells in vitro at doses of 2.5- 7.5mM and caused breaks in chromosomes at 1.8mM.[16]

An in vitro study showed that irradiation corresponding to a few minutes of sun exposure greatly amplified the DNA-damaging effects of glyphosate on mammalian cells. The glyphosate metabolite AMPA proved even more damaging, provoking cellular toxic effects from 0.5 ppb, a low environmentally relevant dose that can be found in European rivers and even in drinking water. The effects were even greater when glyphosate was mixed with other pesticides (the so-called “cocktail effect”), including atrazine. The authors concluded that “the Directive

Standards for Pesticides in Drinking Water should be re-evaluated according to these underestimated factors of risk”.[17]

Glyphosate and Roundup caused DNA damage in human mouth cells in vitro after a single 20-minute exposure at much lower doses than those used in agriculture. Roundup was much more toxic than glyphosate alone. The study showed that in principle, people who are exposed to Roundup through inhalation (as in South American soy-producing countries) could suffer DNA damage. With both glyphosate and Roundup, DNA damage occurred at concentrations below those required to cause cell damage, suggesting that the DNA damage was caused directly by these substances instead of being an indirect result of cell toxicity.[18]

Glyphosate and Roundup caused damage to DNA and chromosomes in the bone marrow of mice in vivo and in human cells in vitro. Roundup was only slightly more toxic than glyphosate.[19]

Roundup caused mutations in the DNA of fruit flies.[20] Roundup increased the frequency of DNA adducts (cancer-causing chemicals that link to DNA), which can mark the onset of cancer, in the liver and kidneys of mice.[21]

Genetic damage was found in soybean workers exposed to pesticides, glyphosate herbicides among them, in Brazil.[22]

GMO Myths and Truths, Page 207

Ecuadorian people exposed to aerial glyphosate herbicide spraying showed a higher degree of DNA damage in blood cells than a control population. The researchers ruled out tobacco, alcohol, non-prescription drugs and asbestos as causes. None of the individuals had used or been exposed to other herbicides or pesticides when the samples were taken. The study also found acute poisoning reactions to the glyphosate herbicide spraying, including intestinal pain and vomiting, diarrhoea, fever, heart palpitations, headaches, dizziness, numbness, insomnia, burning eyes, blurred vision, difficulty in breathing, and skin rash.[23]

Endocrine (hormone) disruption

Laboratory studies on animals and in vitro experiments on human cells indicate that glyphosate herbicides and glyphosate alone are endocrine disruptive chemicals (EDCs). Endocrine disruption can cause cancer, birth defects, and other reproductive and developmental problems.

The endocrine-disruptive effect of glyphosate and its commercial formulations is their most worrying toxic effect. This is because EDCs do not function like normal poisons, where a higher dose gives greater toxicity. Instead they exert their effects at very low doses and exposure over long periods of time can lead to severe ill health.[24] Often, endocrine disruptive effects are seen at lower doses but not at higher doses.[24,25]

Study findings include the following:

- Glyphosate herbicide altered hormone levels in female catfish and decreased egg viability. The study concluded that the herbicide is harmful to catfish reproduction.[26] Roundup disrupted production of the steroid hormone progesterone in mouse cells.[27] Glyphosate herbicide was a potent EDC in rats, causing disturbances in reproductive development after exposure during puberty.[28]

- In an in vitro experiment in human cells, glyphosate herbicides prevented the action of androgens, the masculinizing hormones, at levels up to 800 times lower than glyphosate residue levels allowed in some GM crops used for animal feed in the USA. DNA damage was found in human cells treated with glyphosate herbicides at these levels. Glyphosate herbicides disrupted the action and formation of estrogens, the feminizing hormones. The first toxic effects were found at the low dose of 5 ppm and the first endocrine disruption at 0.5 ppm – 800 times less than the 400 ppm level authorized for some animal feeds.[29]

- Roundup herbicide at environmentally relevant exposure levels (down to 0.00023% glyphosate dilution of the commercial formulation) caused the dysregulation of large numbers of genes in human breast cancer cells grown in the laboratory in vitro. Of the 1,550 genes analyzed, expression of 680 was either increased or decreased. Roundup was able to replace and work synergistically with estrogen, which is required for growth of the breast cancer cells. This demonstrates the strong potential endocrine disruptive potential of glyphosate in this hormonal system. The authors commented, “There remains an unclear pattern of very complex events following exposure of human cells to low levels of glyphosate, but events surrounding the altered levels of expression of only three genes... out of the entire battery tested, are both complicated and potentially damaging to adult and fetal cells.”[30]

GMO Myths and Truths, Page 208

- Glyphosate alone increased the proliferation of estrogen-dependent breast cancer cells by estrogenic mechanisms in vitro.[31]

→ An in vivo study of Roundup administered to rats in drinking water diluted to 50ng/L glyphosate equivalence – half of the level permitted in drinking water in the EU[32] and 14,000 times lower than that permitted in drinking water in the USA[33] – resulted in severe organ damage and a trend of increased incidence of mammary tumours in female animals over a 2-year period of exposure.[34] This type of non-linear endocrine disruptive effect of glyphosate and Roundup is not taken into account in safety evaluations, resulting in exposures to the public that could lead to severe illness and reproductive and developmental problems.

Malformations and reproductive and developmental toxicity

A study on the reproductive effects of Roundup on male and female offspring of rats exposed during pregnancy and lactation found significant adverse effects at non-maternally toxic doses. Findings in male offspring included a decrease in sperm number and daily sperm production during adulthood, an increase in the percentage of abnormal sperms, a dose-related decrease in serum testosterone level at puberty, and sperm cell degeneration. The authors noted that Roundup had been found in other experiments to inhibit steroidogenesis (formation of steroid hormones) in vitro by disrupting the expression of a regulatory protein, but glyphosate did not, indicating that at least one other component of the formulation is required to disrupt steroidogenesis.[35]

A study of farming families in Ontario, Canada found a higher than normal rate of late miscarriages and premature births associated with male glyphosate herbicide exposure.[36] Monsanto claimed in non-peer-reviewed articles that the association for glyphosate was weak and not statistically significant.[37,38] But in the study, the odds ratios (a statistical measure of a possible link) were 1.5 for an association between glyphosate herbicide exposure and miscarriage and 2.4 between glyphosate herbicide exposure and premature birth. 1.5 is near the lower limit but 2.4 is fairly strong. Both indicate an association.

Studies on glyphosate alone commissioned by industry in support of regulatory authorization showed that it caused malformations in rabbits and rats. These effects were not only found at high maternally toxic doses but also at lower doses. Statistical significance was not always achieved at lower doses, perhaps because too few animals were used. Germany, the "rapporteur" member state for glyphosate, responsible for liaising between industry and the EU authorities during the approval process, dismissed the findings, using unscientific reasoning and practices.[2]

Roundup and glyphosate tested alone caused malformations in chicken and frog embryos at doses far below those used in agricultural spraying. Malformations were of a similar type as those reported in human populations exposed to Roundup spraying in GM soy-producing regions of South America. Glyphosate itself was responsible for the malformations in the chicken and frog embryos, rather than the adjuvants in the commercial formulation.[39]

The study identified the mechanism of toxicity as interference with the retinoic acid signalling pathway. This pathway is present in higher animals and affects gene expression. When disrupted, it can result in the development of malformations.[39] This finding countered

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claims or implications by industry authors that glyphosate is non-toxic to animals on the supposed grounds that its sole mechanism of toxicity is the shikimate biochemical pathway, which plants have but animals lack.[40]

Roundup was found to cause skeletal malformations in rat foetuses after the mothers were dosed during pregnancy. The authors observed that the findings were not due to poisoning of the mother (maternal toxicity) and concluded that Roundup had a direct toxic effect on the foetuses. They also noted that the Roundup formulation was more toxic than glyphosate alone.[41]

Glyphosate herbicide caused malformations in tadpoles, even at concentrations that caused low mortality.[42]

An epidemiological study carried out in California showed a modest association between Roundup exposure and anencephaly, a type of neural tube birth defect or malformation of the structures of the developing brain and spinal cord, in which part of the skull and brain are missing.[43,44]

The authors found that the association was present using one type of analytical model (a multiple pesticide model), but not with another (a single pesticide model). The authorsdid not show the data in which they applied either model. But Table 2 of their publication reveals modest associations between glyphosate and neural tube defects for both the single pesticide and multiple pesticide models – with an odds ratio (OR, a statistical measure of

a possible link) of 1.5 for both. For the hierarchical model they found an OR of 1.4. Their criteria for significant effects were that the OR should be greater than or equal to 1.4 and the lower limit of the confidence interval (CI) should be greater than or equal to 0.9.[44] The OR requirement is met for glyphosate and neural tube defects using both models, but both models deliver CIs that are just below the cut-off: 0.8.

These results could reasonably be interpreted as indicating a modest association between glyphosate herbicide exposure, neural tube defects, and anencephaly.

This finding is consistent with findings in frog and chicken embryos[39] and rats,[41] which also linked glyphosate/Roundup exposure to impaired development of the structures of the central nervous system. It is also consistent with findings of industry studies on the effects of glyphosate alone in rats, in which the observed malformations included "reduced ossification of one or more cranial centres".[45] These malformations involving the structures of the central nervous system are consistent with descriptions of retinoic acid-induced malformations in the literature.[2,46]

Cancer

In a laboratory study, Roundup was found to promote cancerous tumour growth in theskin of mice.[47] An epidemiological study of pesticide applicators in the USA found that exposure to glyphosate herbicide was associated with higher incidence of multiple myeloma, a type of blood cancer.[48] Epidemiological studies conducted in Sweden found that exposure to glyphosate herbicide was linked with a higher incidence of non-Hodgkin's lymphoma, another type of blood cancer.[49,50,51]

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The EU's 2002 review of industry studies on glyphosate claimed "no evidence" of carcinogenicity (ability to cause cancer).[1] But two long-term studies on rats indicating possible carcinogenic effects already existed at this time. These long-term studies on rats were conducted in 1979–1981 and 1988–1990.[52] The rats received relatively low doses of glyphosate per day in the first study and higher doses in the second. The first study found an increase in tumours in the testes of rats fed glyphosate, but the same effect was not found in the second test using the higher doses. On this basis, glyphosate was excluded from the carcinogenic category of chemicals.[52,41]

However, this move was based on outdated and incorrect assumptions about toxicology. Cancers can be triggered by the endocrine disruptive effects of a chemical, which can occur at extremely low doses. As explained above, EDCs can have more potent endocrine disruptive effects at lower doses than higher doses. Sometimes a disruptive effect seen at the lower dose is not seen at all at a higher dose.[24]

Low-dose effects cannot be predicted by effects at higher doses, such as are tested in regulatory tests performed on pesticides, including glyphosate. Regulatory tests do not require low doses to be tested for possible endocrine disrupting effects.[25] Therefore the findings of the long-term cancer studies on rats discussed above[52] should be re-evaluated in light of up-to-date scientific knowledge.

Neurotoxicity

A toxicological study on rats found that glyphosate depleted the neurotransmitters serotonin and dopamine.[53] It is not clear from the published study whether the test substance was pure glyphosate or a complete commercial formulation. Glyphosate was also found to injure rat brain cells tested in vivo.[54]

An epidemiological study carried out in Minnesota, USA found that the children of pesticide applicators exposed to glyphosate herbicides had an increased incidence of neurobehavioral disorders, including ADHD (attention deficit hyperactivity disorder). The finding suggested that glyphosate herbicide impacts neurological development.[55]

A clinical case study described how a man[56] who was exposed to glyphosate herbicide developed the neurological disorder Parkinson's disease. A separate case study involving a woman[57] found the same result, though in this case it is not clear if the exposure was to glyphosate alone or a complete formulation, as the exposure took place in a factory that manufactured herbicides.[57]

An in vitro study suggested a mechanism through which glyphosate could cause Parkinson's disease: glyphosate alone was found to induce programmed cell death and degradation leading to death in PC12 cells – human cells that serve as an experimental model for nerve cells.[58]

Negative effects on gut bacteria

An in vitro study carried out to investigate the rise in botulism disease in cattle in the past 10–15 years found that glyphosate and Roundup were toxic to beneficial gut bacteria that

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inhibit the growth of the botulism-causing bacterium Clostridium botulinum, but non-toxic to the botulism-causing bacteria themselves. In short, glyphosate and Roundup favoured the growth of botulism-causing Clostridium botulinum bacteria. The authors concluded that ingestion of Roundup residues in cattle feed could predispose cattle to falling ill with botulism.[59]

In a separate in vitro study on strains of bacteria found in the gut of poultry, most of the pathogenic bacteria tested were highly resistant to Roundup, but most of the beneficialgut bacteria tested were found to be moderately to highly susceptible. The researchers documented the antibiotic damage done to beneficial bacteria in the gut by very low concentrations of Roundup, which allowed the overgrowth of serious pathogens such as Clostridium botulinum, Salmonella spp, and E. coli. These would otherwise be kept in check by the beneficial bacteria that were wiped out by the Roundup residues in feed.[60]

The authors concluded that the ingestion of Roundup-contaminated feed could be a significant factor predisposing poultry to diseases caused by Clostridium botulinum. It could also explain the now widespread contamination of poultry products with pathogenic Salmonella and E. coli strains of bacteria, which can make human consumers ill.[60]

Metal chelating effect

Glyphosate chelates (binds to) essential nutrient metals, including manganese, magnesium, iron, zinc, and calcium, making them unavailable to plants sprayed with the herbicide[61,62] and thus to the people and animals that eat the plants. A German-Egyptian team of researchers found that all cows tested from Danish dairy farms excreted glyphosate in their urine. Unexpectedly low levels of manganese and cobalt were observed in all animals, which the authors said could be explained due to the strong metal chelating effect of glyphosate. Potential signs of liver and kidney toxicity were also found in the cows, which were consistent with the findings of rodent feeding studies with GM glyphosate-tolerant plants.[63]

This effect could cause human and animal deficiencies in the nutrient metals affected, indirectly impacting their health.

Reviews of health effects of Roundup spraying in South America

In South America a public health crisis has emerged around the spraying of Roundup herbicide on GM Roundup Ready soy, which is often carried out from the air. The spray drifts into people’s homes, schools, food crops, and watercourses. It has been blamed for widespread serious health problems.

A report commissioned by the provincial government of Chaco, Argentina, found that the rate of birth defects increased fourfold and rates of childhood cancers tripled in only a decade in areas where rice and GM soy crops are heavily sprayed. The report noted that problems centred on "transgenic crops, which require aerial and ground spraying with agrochemicals"; glyphosate herbicides were named as chemicals of concern.[64]

A review of studies on the health effects of glyphosate and Roundup, as well as other pesticides used with GMOs, in human and animal model systems concluded that the

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precautionary principle was not being observed with regard to the GMO herbicide-tolerant agricultural model. The authors concluded, "It will not be possible to devise a sustainable agriculture that satisfies social needs if man does not begin to prioritize policies that enhance environmental and food security over the interests of private agrochemical industries and markets."[65]

A non-peer-reviewed report by Argentine physicians and scientists, based on clinical data, detailed acute and chronic health effects in people associated with increased cultivationof GM soy and exposure to the spraying of glyphosate herbicides. Health effects included increased incidence of birth defects (including in young mothers), miscarriages, and cancers in children and young people as well as adults. Also noted were increased incidence of difficulty conceiving, genetic damage (which can lead to cancer and birth defects); increased cases of toxic liver disease, neurological developmental problems in children, kidney failure, respiratory problems, and allergies. DNA damage was also found in people exposed to spraying.[66]

The physicians commented that they had been serving the same populations for over 25 years, but the recent trends were unusual and linked to a systemic increase in the spraying of pesticides.[66]

Roundup link with modern diseases suggested

A review published in 2013 (Samsel and Seneff, 2013) hypothesized a mechanism by which glyphosate herbicides could be contributing to modern human diseases that are on the increase worldwide. The authors focused especially on celiac disease and gluten intolerance, but also drew potential links between glyphosate toxicity and a broader range of diseases, such as ADHD (attention deficit hyperactivity disorder), autism, Alzheimer's disease, infertility, birth defects, and cancer.[67]

The review cited glyphosate's known ability to disrupt gut bacteria and to suppress the activity of the cytochrome P450 (CYP) family of enzymes, which play an important role in detoxifying harmful chemicals. The authors concluded that glyphosate enhances the damaging effects of other foodborne chemical residues and environmental toxins.[67]

If this potential pathway to modern diseases is confirmed by further research, it highlights the industry's failure to consider any mechanism of glyphosate toxicity other than the shikimate pathway, which plants have but humans and animals do not.[40] In a second review, Samsel and Seneff pointed out that gut bacteria have this pathway and are susceptible to glyphosate toxicity, with the resulting disruptions in gut bacteria potentially impacting human and animal health. In addition, the authors noted glyphosate's ability to chelate essential nutrient metals, making them unavailable to human and animal consumers, thus potentially affecting their health.[68]

Roundup linked to chronic kidney disease

An epidemic of chronic kidney disease in farming regions of Sri Lanka and other countries has been linked in a study to exposure to Roundup. The study's authors propose that

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glyphosate becomes highly toxic to the kidney when it mixes with "hard" water or heavy metals like arsenic and cadmium, either naturally present in the soil or added in the form of fertilizers. Hard water contains metals such as calcium, magnesium, strontium and iron, along with carbonate, bicarbonate, sulphate and chlorides. Glyphosate chelates or binds to these substances and carries them to the kidneys, resulting in the destruction of tissue.[69]

The study prompted the Sri Lankan government to order a ban on glyphosate herbicides.[70] Under pressure from the plantation sector, the ban was subsequently watered down to a restriction in areas where chronic kidney disease was most serious[71] and later rescinded.

It is noteworthy that kidney problems were also observed in laboratory animals that received Roundup in water over a long-term 2-year period.[34]

Courts rule Roundup not safe – Brazil seeks to ban it

Claims that Roundup and glyphosate are safe for human health and the environment have been overturned in courts in the US[72] and France. The French court forced Monsanto to withdraw advertising claims that Roundup is biodegradable and leaves the soil clean after use.[73]

In 2014 in Brazil, the Federal Public Prosecutor requested the Justice Department to suspend the use of glyphosate herbicides, the most widely used herbicides in the country. The Prosecutor ordered the National Health Surveillance Agency (ANVISA) to re-evaluate the toxicity of glyphosate, along with eight other pesticide active ingredients suspected of causing damage to human health and the environment.[74]

Arguments that Roundup replaces more toxic herbicides are false

GMO proponents often argue that Roundup has replaced more toxic herbicides and that GM Roundup Ready (RR) crops therefore reduce the toxic burden on humans and the environment. But this is false. GM RR crops have not only increased the use of glyphosate herbicides but have also increased the use of other, potentially even more toxic herbicides, due to the spread of glyphosate-resistant weeds (see Myth 5.2). Farmers can no longer control weeds with glyphosate alone and add other herbicides to their spray mix.

Also, as we have seen, the presumed safety of Roundup is a marketing claim that does not reflect the scientific facts.

Health risks of other herbicides used with GM crops

As the spread of glyphosate-resistant weeds makes Roundup Ready GM crop technology obsolete, industry is developing crops that resist other herbicides, either in addition to, or instead of, glyphosate. The health risks of these other herbicides need to be considered in any evaluation of the relevant herbicide-tolerant GM crops.

For example, the GM seed and agrochemical company Dow is seeking USDA approval of GM

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corn and soybeans resistant to 2,4-D, an ingredient of Agent Orange. The USDA has given a positive opinion on the applications, though final approval of the 2,4-D crops is being strongly opposed by health professionals and groups such as the Center for Food Safety.[75]

Exposure to 2,4-D has been linked in studies to genetic damage,[76,77,78] endocrine disruption,[76,79,80] reduced sperm count,[81] reproductive problems,[82] birth defects,[83] Parkinson’s disease,[84] and harmful impacts on brain development.[85,86]

Scientists warn that widespread cultivation of 2,4-D resistant soybeans alone would trigger a substantial increase in the use of 2,4-D, damage to non-target crops through drift, and the inevitable spread of 2,4-D-resistant weeds.[87]

Conclusion

Claims of safety for Roundup are misleading. Many independent studies show that the complete formulations as sold and used are much more toxic than glyphosate alone, though even glyphosate alone has been found to be toxic.

Toxic effects of Roundup and glyphosate found in studies include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, malformations, cancer, and neurotoxicity.

Roundup and other glyphosate formulations have never been tested or assessed for long- term safety for regulatory purposes, as only the isolated supposed "active ingredient" glyphosate was tested by industry in long-term studies. In addition, the "cocktail" effect of increased toxicity created when glyphosate is mixed with other pesticides has never been tested for regulatory purposes. This is in spite of the fact that people and animals are exposed not to single chemicals but to chemical mixtures.

Industry claims that glyphosate is non-toxic to animals and humans because they lack the shikimate biochemical pathway present in plants. But this claim is false. There are other pathways through which glyphosate and its commercial formulations can have toxic effects on animals and humans. Glyphosate and Roundup have been found to interfere with the retinoic acid signalling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning

of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine disruptors, an effect that can lead to multiple health problems during development and adult life.

The endocrine disruptive effects are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time.

Even industry studies on glyphosate alone show ill effects on laboratory animals, including malformations (birth defects). These effects were dismissed by regulators using unscientific reasoning.

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Claims that the Roundup used on GM Roundup Ready crops replaces even more toxic herbicides are misleading. First, the toxicity of Roundup has been underestimated. And second, the failure of Roundup Ready technology due to resistant weeds has resulted in the industry developing GM crops that tolerate other, potentially even more toxic herbicides, such as 2,4-D, an ingredient of Agent Orange.

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RESPONSE TO COMMENT LETTER 4 - SHARON RUSHTON, ANN SPAKE, LAURA CHARITON, SUSTAINABLE TAMALMONTE, WATERSHED ALLIANCE OF MARIN, JULY 6, 2015

Response to Comment 4-1

The commentor states the opinion that the Draft TPEIR is inadequate, fails as an informational document, and falls short of CEQA's mandates. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis.

Response to Comment 4-2

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and environmental fate. Please see Response to Comment 4-20 regarding the issue of the use of glyphosate increasing the risk of fire.

Response to Comment 4-3

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity. Please refer to **Master Response 4 – Adjuvants and Inert Ingredients** and **Master Response 6 – Impact Evaluation** for discussions on herbicide formulation toxicity and cumulative impacts. Also see Response to Comment 14-37.

Response to Comment 4-4

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate and effects. Refer to **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality.

Response to Comment 4-5

See Response to Comment 4-04. The District does not use surfactants containing POEA. Refer to **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion of surfactants used by the District.

Response to Comment 4-6

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and environmental fate and effects.

Response to Comment 4-7

The District uses only aquatic approved formulations of glyphosate, which do not contain surfactant. Additionally, the District uses only low-toxicity surfactants per Cal-IPC BMPs. Please see **Master Response 2 – Use of Glyphosate**, **Master Response 4 – Adjuvants and Inert Ingredients**, and **Master Response 6 – Impact Evaluation** for further discussion on glyphosate, cumulative impacts, synergistic effects, and skin absorption of herbicide mixtures. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 4-8

See Response to Comment 4-7.

Response to Comment 4-9

Please see **Master Response 2 – Use of Glyphosate** for a discussion on WHO's conclusions regarding glyphosate.

Response to Comment 4-10

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and potential for endocrine disruption.

Response to Comment 4-11

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and potential for endocrine disruption. Please refer to **Master Response 5 – Herbicide Use** for a discussion on herbicide registration and safety.

Response to Comment 4-12

Please see **Master Response 1 – Multiple Chemical Sensitivity** for a discussion on chemical sensitivity and pesticide allergies. Please refer to **Master Response 2 – Use of Glyphosate** for discussions on glyphosate toxicity. All populations, including potentially sensitive populations (e.g., elderly, infants, etc.) were considered. The degree of exposure to which these populations have to herbicides is extremely limited and less-than-significant. Please see **Master Response 5 – Herbicide Use** for a discussion on procedures taken to prevent exposure to human receptors.

Response to Comment 4-13

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity.

Response to Comment 4-14

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and environmental fate.

Response to Comment 4-15

See Response to Comment 4-04.

Response to Comment 4-16

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and effects on wildlife and non-target plants.

Response to Comment 4-17

The commentor is concerned that implementation of the VBMP would harm biodiversity. To the contrary, the project is designed with the purpose of preserving and protecting biodiversity. Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and effects on wildlife and non-target plants.

Response to Comment 4-18

The suggestion that glyphosate causes a condition similar to Acquired Immune Deficiency Syndrome (AIDS) is ill-informed. Nor is glyphosate a "powerful antibiotic". Glyphosate is a growth regulator that acts through inhibiting the production amino acids necessary for plant growth. It does not produce any effect similar to AIDS. Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and effects on non-target plants.

Response to Comment 4-19

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, environmental fate, spray drift, and effects on non-target plants.

Response to Comment 4-20

The commentor states that implementation of the VBMP would result in a significant increase in the fire hazard because glyphosate would kill or damage non-target vegetation. The MCOSD uses small amounts of glyphosate to target invasive broadleaf woody species, such as French and Scotch broom. The best management practices (BMP) described in the draft VBMP (**BMP-Invasive Plant-1** and **BMP Fuel Management-2**) requires that the MCOSD use an IPM approach to treat invasive weeds. This approach requires the use of the least harmful method to treat invasive plants, including using the least amount of herbicides as possible and avoiding application of herbicides to non-target vegetation. Additionally, the BMPs also directs the MCOSD to treat all green waste by chipping or burning on site or disposing at an offsite location. In the unlikely event that non-target species are affected by any herbicides, the MCOSD would chip, burn, or remove this vegetation along with the treated invasive plants. Thus, all of the affected vegetation would be removed so that fire hazards are not increased in the area. Therefore, the use of glyphosate would not result in a significant impact to the risk of wildfire.

Response to Comment 4-21

The commentor states that glyphosate predisposes plants and trees to disease, including sudden oak death. The commentor is referring to an article by Johal and Huber from 2009 in the European Journal of Agronomy ("Glyphosate effects on diseases of plants"). That article focuses on the impacts of glyphosate on agricultural crops and the interactions of glyphosate treatment with various crop plant diseases. It does not examine the role of glyphosate in the virulence of sudden oak death (caused by *Phytophthora ramorum*). However, a fair conclusion from this research is that oaks sprayed with glyphosate would be weakened and thus have an increased susceptibility to death by *Phytophthora ramorum*. But the authors of the published study concluded that the susceptibility of plants to diseases can be significantly reduced or eliminated if the amount of herbicide applied to them is limited. If very limited use of glyphosate were to accidentally be applied to leaves of an oak tree (due to proximity to target species), the amount applied would be so low and the amount of tree leaf area affected so low that no negative impacts to the oaks would be anticipated.

It is true that any factor that increases plant stress, such as drought or herbicide application, would decrease its ability to fight pathogens such as sudden oak death (*Phytophthora ramorum*). The draft VBMP includes BMPs that avoid the potential impact to non-target vegetation. These include:

- **BMP Invasive Plant 1** requires the MCOSD to use an IPM approach.

- **BMP Invasive Plant 2** requires the MCOSD to limit herbicide use near sensitive natural resources.
- **BMP Fuel Management 9** requires the MCOSD to conform with all requirements limiting the spread of sudden oak death.

Additionally, the draft VBMP includes specific policies and programs to address forest health management, including sudden oak death. These policies, programs, and BMPs would reduce the spread of pathogens on MCOSD land, even if glyphosate increases stresses on non-target vegetation. Therefore, the use of herbicides would not result in a significant impact on the spread of vegetation pathogens, such as sudden oak death.

Response to Comment 4-22

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, environmental fate, and the potential for non-target impacts.

Response to Comment 4-23

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide labels and safety, and **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, safety, and environmental fate.

Response to Comment 4-24

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide labels and safety, and **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, safety, environmental fate, and the WHO's conclusions regarding glyphosate.

Response to Comment 4-25

The herbicides used by the MCOSD are transported using methods consistent with applicable local, state and federal regulations including, but not limited to those required by the US Department of Transportation (US DOT) and the California Highway Patrol (CHP). Because the MCOSD uses an Integrated Pest Management (IPM) approach, herbicide applications are made on an "as-needed" basis and are not performed on a regular schedule nor are herbicide applications made at predetermined locations. Accordingly, it is not possible to disclose herbicide types or quantities and routes of travel in the TPEIR.

Response to Comment 4-26

Please see **Master Response 5 – Herbicide Use** for a discussion on postings, signage, and safety.

Response to Comment 4-27

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate.

Response to Comment 4-28

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate, spray drift, and human health and safety.

Response to Comment 4-29

Please see **Master Response 5 – Herbicide Use** for a discussion on postings, signage, and safety. Please refer to **Master Response 2 – Use of Glyphosate** for a discussion on the environmental fate of glyphosate.

Response to Comment 4-30

See Response to Comment 4-23.

Response to Comment 4-31

See Response to Comment 4-23.

Response to Comment 4-32

See Response to Comment 4-23.

Response to Comment 4-33

See Response to Comment 4-29.

Response to Comment 4-34

See Response to Comment 4-29.

Response to Comment 4-35

See Response to Comment 4-27.

Response to Comment 4-36

See Response to Comment 4-28.

Response to Comment 4-37

See Response to Comment 4-29.

Response to Comment 4-38

Herbicides are typically transported in small (less than five gallon) containers to the project site where they are then added to a tank that contains water. This dilute herbicide solution is then applied as needed. This standard practice allows for the safe transportation of the herbicide in the smallest volume possible and allows for the appropriate amount of herbicide solution to be prepared just prior to use. Preparation of the herbicide solution off site and then transporting it to the location of use would require transportation of an herbicide solution that is greater in volume than the standard practice described above. In the event of a spill or leak, the volume of herbicide requiring cleanup would be greater if solution preparation was done off site. Because the MCOSD uses an IPM approach, only the smallest amount of herbicide necessary to achieve control is used. Due to rapidly changing site conditions and the use of IPM techniques, site-specific herbicide solutions are prepared based on conditions existing the day of application. Off-site mixing may result in the preparation of an unnecessarily large volume of herbicide solution which would result in the need to either transport or store the excess herbicide solution or dispose of it. As stated above, it is undesirable to transport large volumes of herbicide solutions. Storage of herbicide solutions is not advisable because the herbicide may degrade while sitting and therefore not be efficacious when applied later.

Response to Comment 4-39

Please see **Master Response 6 – Impact Evaluation** for a discussion on spray drift and volatilization. See Response to Comment 4-47.

Response to Comment 4-40

See Response to Comment 4-23.

Response to Comment 4-41

See Response to Comment 4-23.

Response to Comment 4-42

As defined by the State of California, glyphosate is not a hazardous material. Further, glyphosate is not considered by the US Department of Transportation (USDOT) as a hazardous material (CFR Title 49, Subtitle B, Chapter I, Subchapter C, Part 172.101). Because the MCOSD uses an IPM approach, only the amount of herbicide solution that is needed is prepared. As a result, no excess solution is created and therefore no waste, hazardous or otherwise, is generated. For additional information, please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, safety, and environmental fate.

Response to Comment 4-43

Please see the Response to Comment 4-42.

Response to Comment 4-44

Please see Response to Comment 4-42. Refer to **Master Response 2 – Use of Glyphosate** for a discussion on the WHO's conclusions regarding glyphosate.

Response to Comment 4-45

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate safety, spray drift, and environmental fate.

Response to Comment 4-46

See Response to Comment 4-39.

Response to Comment 4-47

Rope wick applications involve the use of an absorbent wick that takes up herbicide formulation and then the wick is brought into direct contact with the intended target plant, transferring the herbicide to the plant. Because the herbicide solution comes into direct contact with the plant, there is no opportunity for the herbicide to enter the air and as a result no air emissions occur. Foliar applications are done using a low pressure tank and application system with nozzles that produce large droplet sizes that minimize or eliminate drift. As needed, adjuvants are added to the tank mix to retard drift and enhance adherence of the herbicide to the plant. As required by the product label, herbicide applications are not made during times when sufficient wind is present that may result in a drift hazard. The combination of the aforementioned facts minimizes or prevents herbicide drift to non-target sites including schools. The Marin County IPM Ordinance maintains a list of pesticides that are allowed for use. Glyphosate is among the list of herbicides on the approved list, and in the case of the MCOSD, it is used to maintain "critical habitats to protect endangered plants and native species". Comparison of data regarding glyphosate detections in air and rain from a highly agricultural area where glyphosate has significant use to the MCOSD is not valid because no production agriculture occurs in the MCOSD and glyphosate use in extremely small by comparison. Accordingly, the amount of glyphosate and its degradation products, if any, that may be detectable in air or rain as a result of MCOSD use is expected to undetectable. Also, please refer to **Master Response 2 – Use of Glyphosate**, **Master Response 5 – Herbicide Use** and **Master Response 6 – Impact Evaluation**.

Response to Comment 4-48

See Response to Comments 4-46 and 4-47.

Response to Comment 4-49

Please see Response to Comments 4-23 and 4-51.

Response to Comment 4-50

See Response to Comment 4-23.

Response to Comment 4-51

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate, endocrine disruption, and human health and safety.

Response to Comment 4-52

Please see Response to Comments 4-23 and 4-51.

Response to Comment 4-53

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide regulations, postings and signage, and human receptor exposure and safety.

Response to Comment 4-54

See Response to Comment 4-23.

Response to Comment 4-55

See Response to Comment 4-23.

Response to Comment 4-56

See Response to Comment 4-23.

Response to Comment 4-57

See Response to Comment 4-29.

Response to Comment 4-58

See Response to Comment 4-29.

Response to Comment 4-59

See Response to Comment 4-29.

Response to Comment 4-60

See Response to Comment 4-29. Refer to **Master Response 6 – Impact Evaluation** for a discussion of spray drift.

Response to Comment 4-61

It is correct that the MCOSD has a robust volunteer program. An overview of the role volunteers can, and will play in implementation of vegetation management actions now and in the future is described on pages 5-31 through 5-44 of the draft VBMP. Volunteers are not, however, involved in the application of herbicides. All herbicide applications, as discussed in the draft VBMP, would be performed under the supervision of a Qualified Applicator License (QAL) and Qualified Applicator Certificate (QAC) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years.

Impact 5.5-2 Applicator and Preserve User Exposure in the Draft TPEIR explains the procedures the MCOSD will implement in regard to herbicide application, notification, and signage procedures. It is stated that herbicide exposure to human receptors (both applicator and preserve user) would be a less-than-significant impact. Included in this analysis would also be MCOSD volunteers.

Response to Comment 4-62

Please see **Master Response 12 - Deferral of Analysis and Mitigation** for a response to this comment.

Response to Comment 4-63

See **Master Response 7 - Hydrology and Water Quality**, which includes revisions to Mitigation Measure 5.2-1. Also see **Master Response 10 - Mitigation Measure 5.5-1(a)**.

Response to Comment 4-64

Please see **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation** for a response to this comment.

Response to Comment 4-65

See **Master Response 7 - Hydrology and Water Quality**, which includes revisions to Mitigation Measure 5.2-1. Also see **Master Response 10 - Mitigation Measure 5.5-1(a)**.

Please see **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation** for a response to this comment.

Response to Comment 4-66

See **Master Response 7 - Hydrology and Water Quality**, which includes revisions to Mitigation Measure 5.2-1. Also see **Master Response 10 - Mitigation Measure 5.5-1(a)**. The expanded water quality protection BMPs recommended for adoption would apply restrictions on the seasonal timing of herbicide applications, which along with BMPs for handling, transport, and mixing of herbicides and protocols for application within waterbody buffers constitute the best available technology for controlling invasive plant infestations at the minimum risk of water quality impairment.

Response to Comment 4-67

See **Master Response 7 - Hydrology and Water Quality**, which includes revisions to Mitigation Measure 5.2-1. Also see **Master Response 10 - Mitigation Measure 5.5-1(a)**. Master Response 7 includes a description of the requirements for the involvement of a state-licensed Pest Control Advisor (PCA) and application supervision by a professional with a Qualified Applicator License/Certificate holder credential. Both of these state-licensed professionals must maintain active bi-annual training to improve their professional abilities and to stay current with best management practices within the framework of IPM. These professionals are also trained in field techniques designed to minimize the risk of non-target exposures, including to water resources.

Response to Comment 4-68

Please see **Master Response 5 – Herbicide Use** for a discussion on cut-stump applications. Master Response 5 also provides a discussion on glyphosate toxicity and safety.

Response to Comment 4-69

Please see **Master Response 12 - Deferral of Analysis and Mitigation** for a response to this comment.

Response to Comment 4-70

Please see **Master Response 12 - Deferral of Analysis and Mitigation** for a response to this comment.

Response to Comment 4-71

Please see **Master Response 5 – Herbicide Use** for a discussion on substantially similar products. Please see **Master Response 12 - Deferral of Analysis and Mitigation** regarding the commentor's concern that the Draft TPEIR improperly defers the analysis of potential impacts.

Response to Comment 4-72

The Draft TPEIR is not a post-hoc rationalization of decisions that have already been made. To date no decision to approve and implement the VBMP by the MCOSD Board of Directors has been made. As noted on page 75 of the Draft TPEIR after completion of the Final TPEIR the Marin County Parks and Open Space Commission will hold a public hearing to consider its recommendations to the MCOSD Board of Directors on certification of the TPEIR and approval of the VBMP. Subsequent to that hearing, the Board of Directors will hold a second public meeting to consider certification of the Final TPEIR and approval of the VBMP. MCOSD acceptance of the TPEIR upon certification does not require approval of the project studied in the TPEIR.

Response to Comment 4-73

Please see Master **Response 4 – Adjuvants and Inert Ingredients** for a discussion on adjuvants used by the District, inert ingredients, cumulative impacts, and synergism. Also see Response to Comment 14-37 regarding cumulative impacts. Refer to **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate effects.

Response to Comment 4-74

Please see Master **Response 4 – Adjuvants and Inert Ingredients** and **Master Response 6 – Impact Evaluation** for a discussion on adjuvants used by the District, inert ingredients, cumulative impacts, and synergism. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 4-75

As discussed in **Master Response 2 – Use of Glyphosate** and consistent with the risk screening analysis presented in the Draft TPEIR, the impacts of glyphosate use to amphibians and reptiles would be less-than-significant; therefore, glyphosate use is not anticipated to increase the risk of West Nile Virus through preventing tadpoles or frogs from feeding on mosquito larvae nor does it increase the risk of Lyme Disease through preventing lizards from capturing ticks. Please refer to **Master Response Master Response 2 – Use of Glyphosate** for further discussion of glyphosate and effects on wildlife.

Response to Comment 4-76

Please see Response to Comment 4-03.

Response to Comment 4-77

See Response to Comments 4-3 and 4-27.

Response to Comment 4-78

Please see **Master Response 2 – Use of Glyphosate** and **Master Response 6 – Impact Evaluation** for discussions on glyphosate environmental fate and cumulative impacts. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 4-79

See Response to Comment 4-78.

Response to Comment 4-80

See Response to Comment 4-78.

Response to Comment 4-81

See Response to Comment 4-2. Refer to **Master Response 5 – Herbicide Use** for a discussion on herbicide registration, risk assessment, and safety.

Response to Comment 4-82

See Response to Comment 4-7.

Response to Comment 4-83

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, safety, environmental fate, endocrine disruption, and the WHO's conclusions regarding glyphosate.

Response to Comment 4-84

See Response to Comments 4-76 through 4-83.

Response to Comment 4-85

The commentor states that the draft TPEIR fails to evaluate impacts associated with the MCOSD overseeing its own pest management program while not being subject to Marin County's IPM ordinance. In particular, the commentor is concerned the MCOSD staff can make decisions independent of public input. The MCOSD role with respect to the IPM Commission and public input is not an impact on the environment as evaluated under CEQA.

The county developed its IPM ordinance for pest management activities in its developed facilities and parks. The IPM ordinance is not oriented to the management of invasive plants in wildlands. One of the purposes of the VBMP is to provide the MCOSD with a IPM program similar to the ordinance. The MCOSD currently presents it vegetation management activities to the Parks and Open Space Commission (an advisory commission that reports to the Board of Supervisors), and, through that process, the public has an opportunity to provide input. Additionally, the MCOSD complies with all applicable laws and regulations pertaining to the use of herbicides as described in **Master Response 5 – Herbicide Use**. Please see Response to Comment 4-89 for further discussion.

Response to Comment 4-86

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion on alternatives and the herbicide-free approach.

Response to Comment 4-87

The Draft TPEIR describes the herbicides that the MCOSD uses and a screening level risk analysis was done on each herbicide using scientific data from recognized and reviewed sources regarding the environmental fate and toxicity of the herbicides. These data were combined with conservative assumptions regarding exposure to estimate potential risk. As needed, BMPs and/or mitigation measures were designed to address potential risk and reduce it to less-than-significant level.

Response to Comment 4-88

See Response to Comment 4-86.

Response to Comment 4-89

The commentor states that the TPEIR fails to address the Marin County IPM ordinances goal of eliminating pesticides. This comment is on the merits of the plan and not on the environmental effects evaluated in the TPEIR. The MCOSD has revised chapter four of the draft VBMP to establish policies, including a new policy that states that MCOSD will use an IPM approach to control invasive plants and "to reduce the use of herbicides over time." As described in Response to Comment 4-85, the purpose of the County's IPM ordinance is to manage pests on developed county facilities, and does not consider some of the issues with managing vegetation in large opens space areas. One of the purposed of the VBMP is to provide the MCOSD with an IPM approach for its lands.

The MCOSD uses an IPM program and has developed numerous BMPs and mitigation measures to protect people and sensitive natural resources. As practicable and feasible, the MCOSD will reduce and eliminate the use of herbicides. Any reduction or elimination, however, will only be done after a thorough review of the risks such reductions and eliminations may cause. These risks include: injury to MCOSD personnel from the use of manual and power-driven tools; risk of fire and subsequent injury, death and loss of property if vegetation is left uncontrolled and becomes dry fuel; loss of habitat and biodiversity as a result of the inability to adequately control non-native, invasive species; and loss of threatened, endangered and listed species as a result of displacement by non-native, invasive species.

Response to Comment 4-90

Comment noted. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis. MCOSD acceptance of the TPEIR upon certification does not require approval of the project studied (the draft VBMP) in the TPEIR.

Comment Letter 5

MOMS ADVOCATING SUSTAINABILITY

May 21, 2015

MOMS Advocating Sustainability
1005 Northgate Drive #180
San Rafael CA 94903

Marin County Open Space District
Board of Directors
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903-4157 Attention: James Raives
JRaives@marincounty.org

Dear Marin County Open Space District Board of Directors,

We are in the process of reviewing the draft Tiered Program Environmental Impact Report for the Vegetation and Biodiversity Management Plan and will be preparing comments to the Marin County Open Space District (MCOSD) as requested by July 8, 2015.

5-1

We recognize the challenge of protecting natural habitats, preserving diversity and reducing the risk of wildfire. However, our initial review of the TPEIR raises concerns regarding the continued use of toxic pesticides in our public spaces, even within 100' of water. We note that there is inconsistency expressed in the plan by both prohibiting and then allowing their use. Both the public and members of the Board of Supervisors have expressed their desire to eliminate the use of such toxic substances.

5-2

In addition, we are concerned about the proposed 'mitigation measures' that do not eliminate the significant adverse impacts of toxic substances such as glyphosate. A public agency may not rely on mitigation measures of uncertain efficacy or feasibility. CEQA requires an agency to evaluate the environmental effects of a project at the earliest possible stage in the planning process. Adequate specificity is essential for assessment of management plans in order to achieve the desired objectives without negating one, and assuring public health and safety as well as long term sustenance of open space habitats and species based on the most current scientific knowledge.

We urge the Board of Directors to recommend revisions reflecting these concerns.

Respectfully,
Debbie Friedman

Co-Chair & Co-Founder, MOMS Advocating Sustainability

RESPONSE TO COMMENT LETTER 5 - DEBBIE FRIEDMAN, CO-CHAIR & CO-FOUNDER, MOMS ADVOCATING SUSTAINABILITY, MAY 21, 2015

Response to Comment 5-1

Comment noted. Additionally, the VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to managing vegetation in order to increase the program's efficiency and effectiveness. As such, it neither promotes nor prohibits the use of herbicides. Rather, it requires the use of an integrated pest management (IPM) approach, which is a science and evidence-based approach requiring the use of the least environmentally damaging treatment method. Additionally, it should be noted that the draft VBMP does not prohibit the use of herbicides. For example **Table 4.7** (*Recommended Treatment Options for Target Invasive Plants*) in the draft VBMP describes specific chemical control methods as recommended treatment options for target invasive plants. Furthermore, **BMP-Invasive Plant-2** limits but does not prevent herbicide use within 100 feet of sensitive natural resources.

Response to Comment 5-2

The VBMP does not prescribe specific treatment methods, rather it requires the MCOSD to use an IPM approach, which is a science-based program that requires the use of the least environmentally harmful effective treatment method. Mitigation measures have been provided for each significant impact identified in the Draft TPEIR. In each instance, as explained in the Draft TPEIR, implementation of the mitigation measures would reduce identified significant impacts to a less-than-significant impact. Please see **Master Response 2 – Use of Glyphosate** for a full discussion regarding the use of glyphosate**.**

Comment Letter 6

Health Council of Marin
Executive Committee
C/o Jennifer Rienks, PhD, President
jenrienks@aol.com

June 29, 2015

James Raives
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San Rafael, CA 94903-4157
(415) 473-3745 (Tel) (415) 473-3795 (Fax)
JRaives@marincounty.org

Re: Public Comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

The purpose of the **Health Council of Marin** is to advise the Board of Supervisors on health issues, to advocate and educate regarding issues affecting health and well-being of citizens of Marin County.

We continue to encourage use of the Precautionary Principle in public health decision-making, especially regarding public understanding of and involvement in public health issues, and policy-making.

The Introduction to our Countywide Plan states that historically, many environmentally harmful activities were stopped only after they resulted in environmental degradation or serious harm to people and the resulting costs of these significant adverse impacts. The precautionary principle serves to eliminate potential hazards at the onset of an activity instead of the approach that determines "an acceptable level of harm".

Our advice to the Board of Supervisors and the Marin County Open Space District is consistent with the goal of the IPM Ordinance**,** which established a goal of elimination of the use of pesticides. The following motion was passed by the Health Council at our recent meeting on May 26th:

"The World Health Organization has classified Glyphosate as 'probably carcinogenic to humans'. The Health Council of Marin recommends that the County of Marin cease use of Glyphosate and any pesticide considered a carcinogen, possible or probable, in or on any County owned or leased property."

6-01 **I. THE DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE, AND MITIGATE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS FROM GLYPHOSATE AND COMMERCIAL GLYPHOSATE FORMULATIONS BECAUSE IT DOES NOT ADEQUATELY AND ACCURATELY DESCRIBE THE HERBICIDE AND THE FORMULATIONS**

6-02 A. **The Draft TPEIR fails to list the names of surfactant chemicals and list all other adjuvants that would be used;**

6-03 B. **The Draft TPEIR fails to evaluate the effects of surfactants and adjuvants and provide a risk assessment.**

6-04 There has been no skin absorption testing, whatsoever, for the degree to which the skin absorption of glyphosate will be enhanced by Liberate, the surfactant currently used by Parks and Open Space, or Competitor, also a nonionic surfactant, which is also used mixed with glyphosate. The draft EIR is defective in failing to evaluate the negative potential effects of skin absorption of glyphosate which could result from its use with this class of surfactants.

6-05 C. **The Draft TPEIR fails to evaluate the interactive effects of herbicides combined together.**

6-06 **II. The DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE, AND MITIGATE POTENTIALLY SIGNIFICANCT ENVIRONMENTAL IMPACTS FROM GLYPHOSATE AND COMMERCIAL GLYPHOSATE HERBICIDE FORMULATIONS BECAUSE IT FAILS TO ADEQUATELY AND ACCURATELY DISCLOSE AND ANALYZE THE TOCICITY, THE NON-TARGET IMPACTS, THE HIGH ACTIVITY AND MOBILITY, PERSISTENCE, AND CUMULATIVE IMPACTS OF GLYHOSATE AND GLYPHOSATE HERBICIDE FORMULATIONS**

A. The Toxicity and Non-Target Public Health Impacts of Glyphosate and Glyphosate Herbicide Formulations:

6-07

The Draft TPEIR fails to describe glyphosate as highly and chronically toxic. The Draft TPEIR is deficient in that it failed to reflect the following research findings, and their consequences for human health. These findings describe some of the non-target public health impacts and they do not support the Draft TPEIR assumption on Page 259, which states under "Impact Evaluation Approach", "In general, the use of herbicides does not pose unacceptable risk to humans and ecological receptors."

6-08

1. In March 2015, the International Agency for Research on Cancer, part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen. [1] [2]

6-09

2. According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, birth defects, cancer, and neurotoxicity."[3]

6-10

3. "Roundup and other glyphosate herbicide formulations (E.g. AquaMaster, Rodeo, and Roundup Custom) have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including

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[1] Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

[2] American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

[3] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

6-10 (cont.)

malformations.[4,5] Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations.

6-11

4. "Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[6] "The added ingredients (adjuvants) are toxic[7] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[8] [9] [10,11] "In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients.[12,13]

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[4] Antoniou M, Habib MEM, Howard CV, et al. Teratogenic effects of glyphosate-based herbicides: Divergence of regulatory decisions from scientific evidence. J Env Anal Toxicol. 2012;S4:006. doi:10.4172/2161-0525.S4-006.

[5] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[6] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[7] Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

[8] Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem –105. doi:10.1021/tx800218n.

[9] Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. –538. doi:10.1002/ps.539.

[10] Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental ce 2005;113:716-20.

[11] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[12] Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active prin doi:10.1155/2014/179691.

[13] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

6-12

5. Roundup negatively affects gut bacteria that are vital to the healthy functioning of the immune system. The targeted enzyme, EPSP synthase, is found in the microbiota, which reside in our intestines, and therefore this enzyme is found in humans and animals. There are many human and animal health problems associated with the disruption of our intestinal microbes.[14] A complaint in a current lawsuit specifically states; "Because it kills-off our gut bacteria, glyphosate is linked to stomach and bowel problems, indigestion, ulcers, colitis, gluten intolerance, sleeplessness, lethargy, depression, Crohn's Disease, Celiac Disease, allergies, obesity, diabetes, infertility, liver disease, renal failure, autism, Alzheimer's, endocrine disruption, and the W.H.O. recently announced glyphosate is 'probably carcinogenic."[15]

Glyphosate, because it kills beneficial enterococcal bacteria can upset intestinal bacterial balance leading to the proliferation of harmful Clostridia bacteria, and other harmful bacteria, with devastating consequences.[16]

6-13

6. The Draft TPEIR is deficient in that it failed to reflect the following research findings, and their consequences for human health (especially related to skin absorption). Glyphosate interferes with the liver's cytochrome P450 oxidase enzyme system, which controls levels of hormones, including estrogen and testosterone. Excess estrogen is known to promote breast cancer, and excess testosterone stimulates prostate cancer.[17]

Furthermore, that same Enzyme also affects the blood levels and toxicities of many medications, and thereby glyphosate can interfere with achieving proper levels of medications used for: Cancer (Chemotherapeutic Medications), Heart failure and Blood Pressure, High Cholesterol, Infections,

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[14] Swanson, N., 2015. Monsanto Sued in Los Angeles County for False Advertising. Examiner. Available at: http://www.examiner.com/article/monsanto-sued-los-angeles-county-for-false-advertising#

[15] Superior Court of the State of California, County of Los Angeles, 2015. Case No: BC 578 942 CLASS ACTION: Complaint for Damages Preliminary Injunction, and Permanent Injunction; False and Misleading Advertising [B&P Code 17500]. Available at: http://www.monsantoclassaction.org/wp-content/uploads/2015/04/Monsanto-Glyphosate-Class-Action-4.20.2015.pdf

[16] Kruger, M. Shehata, AA, Anaerobe, Vol. 20, pages 74-78, April 2013.

[17] Ref: E. Hietanen, Ph.D. Acta Pharmacol. et Toxicol. 1983, vol. 53.

6-13 (cont.)

Blood Clots. Psychiatric conditions, AIDS and Diabetes. The role of cytochrome P450 enzymes in regulating metabolism of medications used in each of the listed illnesses is included in the cautions, for each such medication, delineated in the Physicians' Desk Reference. These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

6-14

7. Glyphosate and Roundup are endocrine disruptors, an effect that can lead to multiple health problems during development and adult life. The endocrine disruptive effects manifest at very low doses and can lead to ill health when exposure takes place over long periods of time."[18]

6-15

8. Glyphosate spraying will increase the risk of West Nile Virus. Research has shown it kills tadpoles and frogs. Since those amphibians eat mosquito larvae, use of Glyphosate, due its harm to those amphibians, could significantly increase the risk of West Nile Virus.[19]

6-16

9. Glyphosate spraying could increase the risk of Lyme disease. According to Jacob Leone ND reporting to the Marin Health Council on March 25, 2014, Lyme disease is endemic to California and Marin County. Regarding epidemiology, he reported that there is greater incidence of Lyme disease in this country than HIV or Breast Cancer.

An article, Lizard, Tick, Lyme Disease Study Yields Surprise, by David Perlman stated; "The tiny black-legged ticks, abundant throughout the woods of Northern California, carry microbes that can cause Lyme disease in humans they bite. The common Western fence lizards eat those ticks by the millions. Wherever the lizards abound, the population of disease-carrying ticks would be low. That's what scientists have believed. And the smaller the tick population, the lower the risk of Lyme disease. Fewer lizards should result in more of the dangerous ticks. Western fence lizards carry a protein in their blood that kills the Borrelia bacteria, which cause Lyme disease. When the ticks feed on the lizards' blood, the protein cleanses

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[18] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[19] Richard A. Relyea, PhD. Ecological Applications, vol. 15, No. 2, 2005.

their bodies of the bacteria, so their annoying bites no longer pose a Lyme disease risk."[20]

6-16 (cont.)

"In 1998 it was discovered that when a Western black-legged tick feeds on a Western fence lizard, the Lyme disease causing bacteria, *Borrelia Borgdorferi*, is killed. The tick lives but its blood is cleansed of the *Borrelia* bacteria, so its next bite becomes more of a nuisance than a threat to one's health."

"In areas with Western Fence Lizards, about 5 % of ticks carry the disease, while in other areas 50 % of ticks harbor the disease."[21]

In a study on the impact of glyphosate formulations with POEA skinks sprint speed was slower. [22]

Sprint speed is an important predictor of lizard health and survival as lizards with slow sprint speeds find it harder to capture prey and escape predators.[23]

B. The High Activity and Mobility of Glyphosate and Glyphosate Herbicide Formulations:

6-17

The Draft TPEIR fails to describe glyphosate as volatile and fails to ensure mobility through soil will not adversely impact water quality.

6-18

1. Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

For herbicides that can be transmitted through air, like glyphosate, the

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[20] Perlman, D., Feb. 22, 2011. Lizard, Tick, Lyme Disease Study Yields Surprise. SF Gate
[21] From Website of Hastings, a biological Field Station of the University of California.
[22] Carpenter, J. K., 2013. Evaluating the effect of glyphosate formulations on the New Zealand common skink (Oligosoma polychroma) (Honours thesis). Victoria University of Wellington, Wellington.
[23] Miles, D. B., 2004. The race goes to the swift: fitness consequences of variation in sprint performance in juvenile lizards. Evolutionary Ecology Research, 6(1), 63- 75.

6-19 potential hazard of sensitive receptors' inadvertent exposure at school sites exists when the herbicides are being used along medians near school sites in the County because they can be stirred up by wind and auto travel and then drift to the schools.

The Draft TPEIR mitigation measures, related to hazardous emissions and the potential for emissions to drift to school sites, fail to disclose the methods of application and falsely presume that using herbicides, such as Glyphosate, will not result in hazardous emissions and be transmitted through the air.

6-20 2. On Page 252, the Draft TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not volatile..." The TPEIR fails to properly disclose and analyze the hazardous emissions of glyphosate and glyphosate herbicide formulations and the potential for such emissions to drift through the air.

A study from the U.S. Geological Survey, entitled "Pesticides in Mississippi Air and Rain: A Comparison Between 1995 and 2007", reveals that Roundup herbicide (a glyphosate herbicide formulation) and its toxic degradation byproduct AMPA were found in over 75% of the air and rain samples tested from Mississippi in 2007.[24]

C. The Persistence and Cumulative Impacts of Glyphosate and Glyphosate Herbicide Formations:

6-21 1. The TPEIR falsely assumes the adverse impacts of glyphosate to be temporary and therefore fails to disclose, analyze and mitigate potentially significant public health impacts from glyphosate and commercial glyphosate herbicide formulations. The public notification is eliminated after 4 days of application and the public is told that contact is safe after application is dry. BMP- Invasive Plant-1 "*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*" fails to protect public health by inadequate notification and signage procedures. On Page 255, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"... "All

[24] U.S. Geological Survey, entitled "Pesticides in Mississippi Air and Rain: A Comparison Between 1995 and 2007"

6-21 (cont.)

Notices of Herbicide Application must be removed **four days** after the application has been made."

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances that persist in soil and water. A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment.

Nomura and Hilton (1977) reported glyphosate half-lives of up to 22 years in soils with pH<6 and organic matter contents of over 90 g kg-1.50 AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days. In water, glyphosate has a long persistence in sediments.

Glyphosate is categorized by the U.S. EPA as *"extremely persistent"*, lasting up to 6 months.[25]

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[26]. The report reached the following conclusions:

- Half-life in soil of Glyphosate and its metabolite AMPA**:**
  The half-life of glyphosate in soil was 44 days. The half-life of AMPA in soil was 46 days.
- Half-life in broom leaves that failed to drop to ground:
  Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites, indicating that half-life of glyphosate is likely to be much longer than

25 U.S. EPA, Division of ecological effects, 1993.

26 Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

6-21 84 days as long as the leaves remain attached to the stems and branches.

III. CONCLUSION

6-22 Thank you for considering all of the points raised in this document regarding significant problems that the Draft TPIER and it failure to adequately disclose, analyze and mitigate these issues.

Very truly yours
/s/
Jennifer Rienks, PhD
President
Health Council of Marin

RESPONSE TO COMMENT LETTER 6 - JENNIFER RIENKS, PH.D., PRESIDENT, HEALTH COUNCIL OF MARIN, JUNE 29, 2015

Response to Comment 6-1

Please see **Master Response 2 – Use of Glyphosate** and **Master Response 5 – Herbicide Use** for a discussion on the use of and potential impacts of glyphosate and herbicides in general.

Response to Comment 6-2

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion on the list of adjuvants used by the District and their ingredients.

Response to Comment 6-3

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion on adjuvant and inert ingredient risk.

Response to Comment 6-4

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion on surfactants and skin absorption of herbicide mixtures in general and **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate skin absorption specifically.

Response to Comment 6-5

Please see **Master Response 6 – Impact Evaluation** and see Response to Comment 14-37 for a discussion of cumulative impacts.

Response to Comment 6-6

Please see **Master Response 2 – Use of Glyphosate** for a discussion of glyphosate use, toxicity, and environmental fate, and Please see **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for a discussion of cumulative impacts.

Response to Comment 6-7

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate use and toxicity.

Response to Comment 6-8

Please see **Master Response 2 – Use of Glyphosate** for a discussion on the WHO's conclusions regarding glyphosate.

Response to Comment 6-9

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and potential for endocrine disruption.

Response to Comment 6-10

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, plus **Master Response 4 – Adjuvants and Inert Ingredients** and **Master Response 6 – Impact Evaluation** for a discussion on evaluating the cumulative risk and of herbicide mixture components.

Response to Comment 6-11

The District uses only aquatic approved formulations of glyphosate, which do not contain surfactant. Additionally, the District uses only low-toxicity surfactants per Cal-IPC BMPs. Please see **Master Response 2 – Use of Glyphosate**, **Master Response 4 – Adjuvants and Inert Ingredients**, and **Master Response 6 – Impact Evaluation** for further discussion on glyphosate, cumulative impacts, synergistic effects, and skin absorption of herbicide mixtures. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 6-12

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate use and toxicity as well as WHO's conclusions regarding glyphosate.

Response to Comment 6-13

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate use, skin absorption, and toxicity.

Response to Comment 6-14

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate and endocrine disruption.

Response to Comment 6-15

As discussed in **Master Response 2 – Use of Glyphosate** and consistent with the risk screening analysis presented in the Draft TPEIR, the impacts of glyphosate use to amphibians is less-than-significant; therefore, glyphosate use is not anticipated to increase the risk of West Nile Virus through preventing tadpoles or frogs from feeding on mosquito larvae. Please refer to **Master Response Master Response 2 – Use of Glyphosate** for further discussion of glyphosate and effects on wildlife.

Response to Comment 6-16

As discussed in **Master Response 2 – Use of Glyphosate** and consistent with the risk screening analysis presented in the Draft TPEIR, the impacts of glyphosate use to reptiles would be less-than-significant; therefore, glyphosate use is not anticipated to increase the risk of Lyme Disease through preventing lizards from capturing ticks. Please refer to **Master Response Master Response 2 – Use of Glyphosate** for further discussion of glyphosate and effects on wildlife.

Response to Comment 6-17

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate volatility and environmental fate.

Response to Comment 6-18

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate volatility, spray drift, and environmental fate.

Response to Comment 6-19

Please see Response to Comment 6-18.

Response to Comment 6-20

Please see Response to Comment 6-18.

Response to Comment 6-21

Please **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate use, safety, and environmental fate. Also, please refer to **Master Response 5 – Herbicide Use** for a discussion on general herbicide safety, postings, and signage.

Response to Comment 6-22

Comment noted. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis. MCOSD acceptance of the TPEIR upon certification does not require approval of the project studied (the draft VBMP) in the TPEIR.

Comment Letter 7

Health & Habitat, Inc.
76 Lee Street
Mill Valley, CA 94941

July 5, 2015

Rom 260

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Re: Public Comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

Health & Habitat (H & H) is a local (Marin County) 501c3 incorporated in 1987. It promotes a holistic approach to life, health and the environment, and helps to achieve a healthy state of equilibrium through education, research and conservation of natural resources, and public charity. It disseminates information in the public interest concerning the above subjects through, but not limited to, lectures, publications, and other media. H & H looks to protect people from exposure to toxins in their air, water and food. This often takes the form of monitoring and advising districts, cities and the county on toxin reduction. It champions using the Precautionary Principle approach to all activities.

7-01 Basically we find the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report inadequate and deficient. For example, they fail to disclose enough information and do not address many of the impacts of pesticides on fish, wildlife, and human health and safety. We have quoted most of an earlier version of the TamAlmonte submission (adding our underlining, bolding, or comments) as it includes most of the points we would make; and we have signed onto their final letter, to besure all the final points are incorporated into this, our comment letter.

7-01 (cont.)

It takes experts in CEQA to properly respond, an expense most individuals and groups cannot afford. This problem makes a mockery of the public process. If one does not use the right phrase, footnote, etc, an agency can ignore the comment.

7-02

An example of inadequacy is that the documents allow for switching products, and there is no process for review. We doubt the County of Marin will use glyphosate now that WHO has declared it a probable human carcinogen; but it could use something worse, or something which has not been tested enough to reveal its toxicity.

7-03

Another inadequacy is failure to satisfactorily consider what will grow after the soil has been poisoned with pesticides? Note that glyphosate persists much, much longer than claimed, and damages soil organisms necessary for plant survival. Our experience has been that non-native grasses come in when broom is removed or killed, thus increasing the hazard of fire ignition - and of course encouraging another plant to be eradicated.

7-04

In the area of the human health risks, documents fail to adequately account for impacts on vulnerable populations including elderly, infants, women, and people with pesticide allergies. One aspect of this is the impact of low doses of pesticides. See paper referenced below, and respond to this.

7-05

An area of H&H's concern – endocrine disruption – has not been satisfactorily addressed, especially as relates to low dose effects and nonmonotonic dose responses, making the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report inadequate and deficient.

Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses

Endocrine Reviews, June 2012, 33(3):0000–0000 edrv.endojournals.org 1

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7-05 (cont.)

(D.R.J.), School of Public Health, University of Minnesota, Minneapolis, Minnesota 55455; Department of Preventive Medicine (D.-H.L.), School of Medicine, Kyungpook National University, Daegu 702-701, Korea; Molecular Profiling Laboratory (T.S.), Massachusetts General Hospital Center for Cancer Research, Charlestown, Massachusetts 02129; Department of Anatomy and Cellular Biology (A.M.S.), Tufts University School of Medicine, Boston, Massachusetts 02111; Division of Biological Sciences (F.S.v.S.) and Department of Biomedical Sciences (W.V.W.), University of Missouri-Columbia, Columbia, Missouri 65211; Biology Department (T.Z.), University of Massachusetts-Amherst, Amherst, Massachusetts 01003; and Environmental Health Sciences (J.P.M.), Charlottesville, Virginia 22902

"For decades, studies of endocrine-disrupting chemicals (EDCs) have challenged traditional concepts in toxicology, in particular the dogma of "the dose makes the poison," because EDCs can have effects at low doses that are not predicted by effects at higher doses. Here, we review two major concepts in EDC studies: low dose and nonmonotonicity. Low-dose effects were defined by the National Toxicology Program as those that occur in the range of human exposures or effects observed at doses below those used for traditional toxicological studies. We review the mechanistic data for low-dose effects and use a weight-of-evidence approach to analyze five examples from the EDC literature. Additionally, we explore nonmonotonic dose-response curves, defined as a nonlinear relationship between dose and effect where the slope of the curve changes sign somewhere within the range of doses examined. We provide a detailed discussion of the mechanisms responsible for generating these phenomena, plus hundreds of examples from the cell culture, animal, and epidemiology literature. We illustrate that nonmonotonic responses and low-dose effects are remarkably common in studies of natural hormones and EDCs. Whether low doses of EDCs influence certain human disorders is no longer conjecture, because epidemiological studies show that environmental exposures to EDCs are associated with human diseases and disabilities. We conclude that when nonmonotonic dose-response curves occur, the effects of low doses cannot be predicted by the effects observed at high doses. Thus, fundamental changes in chemical testing and safety determination are needed to protect human health." (Endocrine Reviews 33: 0000–0000, 2012)

I. INTRODUCTION

CEQA has two basic purposes, neither of which the Draft Marin County Open Space District (MCOSD) Vegetation and Biodiversity Management Plan (VBMP) ("Project") Tiered Program Environmental Impact Report (TPEIR) satisfies.

First, CEQA is designed to inform decision makers and the public about the potential, significant environmental effects of a project.[1] The EIR is the centerpiece of this requirement.[2] The EIR has been described as "an

[1] 14 Cal. Code Regs. ("CEQA Guidelines") § 15002(a)(1).

[2] *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 84.

environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return."[3]

Second, CEQA directs public agencies to avoid or reduce environmental damage when possible by requiring alternatives or mitigation measures.[4]

7-06

The Draft TPEIR fails to satisfy these purposes by failing to disclose, accurately identify and adequately analyze, including improperly deferring the analysis of, all potentially significant environmental impacts of the Draft Vegetation and Biodiversity Management Plan, and failing to provide adequate mitigation measures to avoid impacts. As a result, the Draft TPEIR fails as an informational document and falls short of CEQA's mandates.

II. THE DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS ASSOCIATED WITH GLYPHOSATE AND COMMERCIAL GLYPHOSATE HERBICIDE FORMULATIONS

The DRAFT TPEIR fails to disclose, analyze and mitigate potentially significant environmental impacts from glyphosate and commercial glyphosate herbicide formulations because it does not properly describe the herbicide and the formulations and fails to properly disclose and analyze the toxicity, non-target impacts, high activity and mobility, and fire risk of glyphosate and glyphosate herbicide formulations.

The DRAFT TPEIR (Page 248) describes Glyphosate; "Glyphosate is generally the first choice herbicide due to its low toxicity and low risk of

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[3] *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810.
[4] CEQA Guidelines § 15002(a)(2) and (3) (*See also Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564; *Laurel Heights Improvement Ass'n v. Regents of the University of California* (1988) 47 Cal.3d 376, 400.).

non-target impacts due to the lack of activity in the soil."[5]

The above description is incorrect. Glyphosate is highly and chronically toxic. Glyphosate can have high activity and movement in the soil, depending on conditions, as well as in air and water. Glyphosate use has a significant risk of non-target impacts. Moreover, glyphosate is a patented desiccant and could greatly increase the risk of fire.

A. The Draft TPEIR Fails To Acknowledge That Glyphosate Is Highly And Chronically Toxic And Commercial Glyphosate Herbicide Formulations Are More Toxic

Independent studies show that glyphosate, the active ingredient in glyphosate herbicide formulations identified for use in the Vegetation and Biodiversity Management Plan (AquaMaster, Rodeo, and Roundup Custom), is highly and chronically toxic.

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[6] "The added ingredients (adjuvants) are toxic[7] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[8] [9] [10],,[11]

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5 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 248

6 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

7 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

8 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105. doi:10.1021/tx800218n.

9 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33. doi:10.1002/ps.539.

10 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

"In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[12,,13]

1. Toxic Effects on Aquatic Organisms:
Glyphosate can contaminate surface water either directly as a result of aquatic weed control or indirectly when glyphosate bound to soil particles is washed into rivers, streams, lakes and estuaries[14].

Studies show that peak herbicide concentrations tend to occur during the first runoff after herbicide application and that herbicide flushes can occur during runoff for several weeks to months following application.

When herbicides enter our waterways via stormwater runoff, they can cause a variety of adverse effects to aquatic species. In addition to directly impacting salmon and steelhead, the toxics can harm or kill the aquatic insects that salmon eat. Pollution risks vary depending on the particular chemical, the amount transported in stormwater, and environmental persistence.[15] Marin has endangered Pacific Giant Salamanders.

Studies with fish show that glyphosate can be moderately toxic alone, but when combined with the surfactant normally found in commercial products,

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[11] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[12] Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691.

[13] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[14] World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

[15] National Oceanic and Atmospheric Administration, 2012. Water Quality: How Toxic Runoff Affects Pacific Salmon and Steelhead. National Oceanic and Atmospheric Administration. Available at: http://www.westcoast.fisheries.noaa.gov/publications/habitat/fact_sheets/stormwater_fact_sheet.pdf

the toxicity is greater.[16][17] Glyphosate and commercially formulated products containing POEA (Polyoxyethylenetallowamine) surfactant are toxic to fish and to some aquatic invertebrates[18 19]. POEA is about 30 times more toxic to fish than glyphosate[20].

The toxicity of glyphosate increases with higher temperatures in fish; one study found that the toxicity of glyphosate doubled in bluegill and in rainbow trout test subjects when the temperature of the water was increased from 45 to 63 degrees F.[21 22]

The thesis entitled; "Neurotoxicity of pesticides to salmon: Physiology to Ethology" by Keith Bryan Tierney with the Simon Fraser University Biological Sciences Department[23], demonstrates that pesticides routinely found in the environment can adversely affect neurological systems in salmon. When the nervous system is affected, it impairs environmental information about food, predators, mates, siblings or environmental conditions.

The major focus of Tierney's studies is on the impairment of the relatively exposed olfactory sensory neurons (OSNs), since their functionality is critical to several indispensable behaviors. The responses of OSNs to various

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[16] Folmar, L.C. et al (1979) "Toxicity of the herbicide glyphosate and several of its formulations to fish and aquatic invertebrates." Archives of Environmental Contamination and Toxicology, v 8, 269-278.

[17] Austin, A.P., et al (1991), "Impact of an organophosphate herbicide (glyphosate) on periphyton communities developed in experimental streams." Bulletin of Environmental Contamination and Toxicology, v. 47, 29-35.

[18] World Health Organisation (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

[19] Cox, C., 1995b. Glyphosate, Part 2: Human Exposure and Ecological Effects. J. Pesticide Reform 15 (4), 14-20.

[20] Servizi, J.A., Gordan, R.W. and Martens, D.W., 1987. Acute toxicity of Garlon 4 and Roundup herbicides to salmon, Daphnia and trout. Bull. Environ. Contam. Toxicol. 33, 355-361. Cited in Cox, C. 1995b op cit 12.

[21] Folmar, L.C. et al (1979) "Toxicity of the herbicide glyphosate and several of its formulations to fish and aquatic invertebrates." Archives of Environmental Contamination and Toxicology, v 8, 269-278.

[22] Austin, A.P., et al (1991), "Impact of an organophosphate herbicide (glyphosate) on periphyton communities developed in experimental streams." Bulletin of Environmental Contamination and Toxicology, v. 47, 29-35.

[23] Tierney, K., 2007. Neurotoxicity of pesticides to salmon: Physiology to ethology. Simon Fraser University. Available at: http://summit.sfu.ca/item/8281

behaviorally-relevant odorants were impaired following exposure to several pesticide classes, including triazine (e.g. atrazine), carbamate (e.g. IPBC), organophosphorus (e.g. dimethoate), and phenylurea (e.g. linuron) pesticides, as well as a pesticide formulation (i.e. Roundup). In many cases, within minutes of exposure to environmentally realistic (part per billion) concentrations, impairments of greater than 50% in OSN responses were noted.

In an exposure, the uptake and distribution of pesticides and their metabolites have capacity to alter the neurological system. Clearly, the impairment of this system translates to a genuine survival challenge.

2. Toxic Effects on Invertebrates:

Studies have shown that glyphosate can have both a direct toxic effect and an indirect impact due to habitat change on forest-dwelling invertebrates:

- "In the US, a three-year study found that herbivorous insects and ground invertebrates were significantly reduced up to three years after treatment with Roundup in a four-to-five-year-old clear-cut planted with spruce seedlings. The vegetation did not recover over the study period and the authors concluded that the effects on the forest organisms were mainly due to habitat change[24]."[25]
- "A laboratory study found that Roundup exposure caused a decrease in the survival and a decrease in body weight of woodlice[26]."[27]

3. Toxic Effects on Animals and Humans:

In March 2015, the International Agency for Research on Cancer, part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore

[24] 172. Cited in WHO, 1994 op cit 7.

[25] Buffin, D., Jewell, T., Health and environmental impacts of glyphosate. 2001:19. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

[26] Mohamed, A.I. et al, 1992. Effects of pesticides on the survival, growth and oxygen consumption of Hemilepistus reaumuri. Trop. Zool. 5, 145-153. Cited in Cox 1995b (Reference 12).

[27] Buffin, D., Jewell, T., Health and environmental impacts of glyphosate. 2001: 19. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

classified the herbicide as a Group 2A carcinogen.[28] [29]

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, birth defects, cancer, and neurotoxicity."[30]

"Roundup and other glyphosate herbicide formulations (E.g. AquaMaster, Rodeo, and Roundup Custom) have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including malformations[31]."[32]

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[33], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the **shikimate biochemical pathway**, which plants have but animals lack.[34] This is false, as glyphosate also affects other pathways that are present in

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28 Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

29 American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

30 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

31 Antoniou M, Habib MEM, Howard CV, et al. Teratogenic effects of glyphosate-based herbicides: Divergence of regulatory decisions from scientific evidence. J Env Anal Toxicol. 2012;S4:006. doi:10.4172/2161-0525.S4-006.

32 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

33 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

34 European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

animals and humans.[35]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine disruptors, an effect that can lead to multiple health problems during development and adult life.

The endocrine disruptive effects are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time."[36]

To substantiate the above statements about the high and chronic toxicity of Glyphosate, enclosed (Addendum 1) and incorporated into this comment letter is the full text of Chapter 4.1 of the report entitled; "GMO Myths and Truths – Edition 2" by John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil. Chapter 4.1 is entitled; "MYTH: Roundup is a safe herbicide with low toxicity to animals and humans; TRUTH: Roundup has never been tested or assessed for long-term safety for regulatory purposes but independent studies show it is highly toxic to animals and humans."

C. The Draft TPEIR Fails To Acknowledge That Glyphosate Use Has A Significant Risk Of Non-Target Impacts

Glyphosate can be acutely toxic to non-target plants, including aquatic plants and algae. The effects of this toxicity on natural plant succession alters the ecology of treated areas. In most cases, the plant species diversity will

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35 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

36 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

decrease, and along with it, the numbers of insects, mammals and birds utilizing these areas as habitat.[37 38]

Besides being a patented herbicide, Glyphosate is also a patented mineral chelator, antibiotic, and desiccant. **It disrupts plants' metabolic shikimate pathway, which starves plants of essential nutrients and weakens their immune systems.** Moreover, Glyphosate's desiccating effects reduce a plant's ability to uptake water. It essentially gives the plants a condition similar to "Aids". As a powerful antibiotic, **Glyphosate also kills beneficial bacteria and other microorganisms in the soil.** Beneficial organisms fix atmospheric nitrogen for plants' consumption and are necessary for healthy plant growth.[39] Without these beneficial microorganisms in the soil to compete with and suppress harmful plant soil-borne pathogens, the lethal soil-borne pathogens, such as Fusarium (**see below), take over and ultimately kill the weakened plants.[40 41]

**Fusarium is a naturally occurring soil fungus that is a plant pathogen. Fusarium invades the roots of plants and either kills the plant outright or prevents normal growth.[42]

Glyphosate doesn't just kill the targeted weeds but kills adjacent beneficial vegetation too. As demonstrated in **Comment II. B.** of this comment letter, glyphosate can readily desorb from soil particles in some soil types and can be highly mobile in the soil environment. Glyphosate travels from the root system of the targeted weed into the soil where it is picked up by adjacent roots of desirable plants and trees, ultimately killing them.

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37 Santillo, D.J. et al (1989), "Response of songbirds to glyphosate-induced habitat changes on clear-cut." Journal of Wildlife Management, v. 53 no. 1, 64-71.
38 Connor, J.F. and McMillan, L.M. (1990), "Winter utilization by moose of glyphosate-treated cutovers." Alces 26:91-103.
39 Carlisle, S.M. and Trevors, J.T. (1988), "Glyphosate in the environment." Water, Air, and Soil Pollution 39:409-420.
40 Levesque, C.A. (1987), "Effects of glyphosate on Fusarium spp.: its influence on root colonization of weeds, propagule density in the soil, and crop emergence." Can. J Microbiol. Vol 33, pp 354-360.
41 Sanogo, S., et al,(2000) "Effects of herbicides on Fusarium solani f. sp glycines and development of sudden death syndrome in glyphosate-tolerant soybean." Phytopathology, v. 90 (N1): 57-66.
42 Levesque, C.A. (1987), "Effects of glyphosate on Fusarium spp.: its influence on root colonization of weeds, propagule density in the soil, and crop emergence." Can. J Microbiol. Vol 33, pp 354-360.

Don Huber PhD and Joe Holland authored an article on glyphosate and plant diseases in the European Journal of Agronomy (2009). The article demonstrates that Glyphosate predisposes plants and trees to disease and toxins. The article shows that **glyphosate can increase the spread of Phytophthora (Sudden Oak Death) in oak trees among other plants.**

Glyphosate is also a threat to non-target plants as a result of spray drift from target areas. In the US, sub-lethal doses of herbicides have been blamed for reducing winter hardiness and resistance to fungal diseases in trees.[43]

Studies of the impact of spray drift include:

- "A study of the effects of spray drift of a glyphosate formulation on British species commonly found in nature reserves. The plant species were exposed to spray drift at different distances, wind speeds and application rates (o.5 and 2.2 kg a.i./ha). Death and severe growth suppression occurred at a distance of 2-6 meters from the sprayer. **Sub-lethal effects could be detected up to 20 meters away** for one species, Prunella vulgaris (self heal). Some species were consistently more sensitive including Digitalis purpurea (foxglove), Centaurea nigra (hard head), Prunella vulgaris (self heal) and Lychnis flos-cuculi (ragged robin). Epinasty (more rapid growth of the upper side of an organ causing for example curling in a leaf) was the most frequent symptom of damage[44]...
- A study looked at species typical to UK woodland margins, hedgerows and field margins. The plant communities were exposed to glyphosate and other herbicides each year for at least three years. The effects of sub-lethal doses were measured on species yield, flowering performance, seed production, seed variability and invasion of new species. All species showed some effects within an eight-metre zone[45]...
- A UK Forestry Commission study into the decline of hedgerow ash found that 19 percent of hedgerow ash showed symptoms of dieback. Trees in rural areas were more badly affected than urban trees. In

[43] ENDS Report 193, February 1991.

[44] Marrs R.H., Williams, C.T., Frost, A.J. and Plant, R.A. 1989. Assessment of the effects of herbicide spray drift on a range of plant species of conservation interest. Environ. Pollut 59(1), 71-86. Cited in WHO, 1994 op cit 7.

[45] Marrs, R.H. and Frost, A.J., 1997. A microcosm approach to the detection of the effects of herbicide spray drift in plant communities. J. of Environ.

rural areas, dieback was strongly associated with arable land. The Forestry Commission believes that hormone and glyphosate herbicides commonly affect hedgerow trees and may in part be responsible for the dieback in ash.[46], [47]

D. The Draft TPEIR Fails To Acknowledge That Glyphosate Is A Patented Desiccant And Its Use Increases The Risk Of Fire

Glyphosate is a patented desiccant. Its desiccating effects reduce a plant's ability to uptake water. As already mentioned, glyphosate has non-target impacts. Glyphosate use could lead to Sudden Oak Death (see below), Oak Wilt, and a host of Scorch Diseases in which plants can no longer absorb sufficient water and **thereby become very flammable**. More dry and dead non-target vegetation increases the risk of fire.

Don Huber PhD and Joe Holland authored an article on glyphosate and plant diseases in the European Journal of Agronomy (2009). The article demonstrates that Glyphosate predisposes plants and trees to disease and toxins. In Maryland parks, glyphosate was found to have a very deleterious effect on Red Oaks. The article shows that glyphosate can increase the spread of Phytophthora (Sudden Oak Death) in oak trees among other plants.

E. Conclusion

The Draft TPEIR fails to accurately describe glyphosate and commercial glyphosate herbicide formulations and fails to properly disclose and analyze the toxicity, the high activity and mobility, the non-target impacts, and the fire risk of glyphosate and glyphosate herbicide formulations. Failure to identify and analyze key characteristics of and impacts from glyphosate and glyphosate herbicide formulations prevents finding adequate mitigation measures.

III. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT

[46] Forestry Commission. Bulletin 93, Ash dieback. HMSO. London. (Reported in: ENDS Report 193, February 1991.)

[47] Buffin D, Jewell T. Health and environmental impacts of glyphosate. 2001: 16. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

IMPACTS RELATED TO THE ROUTINE TRANSPORT, USE, OR DISPOSAL OF HAZARDOUS MATERIALS

A. The Draft TPEIR Fails To Adequately Disclose, Analyze And Mitigate Potentially Significant Impacts Related to the Routine Transport, Use, Or Disposal of Hazardous Materials Because The Mitigation Measure Of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

On Page 252, the Draft TPEIR states; "The project would not create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials due the following controls:" … "Herbicides would be applied according to label requirements that are designed to limit the possibility of hazard through regulation of transport, use, and disposal of herbicides."[48]

The above referenced control is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

For years Roundup products were labeled and advertised as "biodegradable" and "environmentally friendly", with claims it "left the soil clean". The definition of biodegradable is "the chemical dissolution of materials by bacteria or other biological means"[49] The words "biodegradable" and "environmentally friendly" provide significant assurances to consumers and Pest Control Advisors/Technicians.

However, in 1996 the New York Attorney General successfully sued Monsanto (manufacturer and patent holder of Roundup) for falsely advertising Roundup. The company could no longer claim that Roundup was "biodegradable" or "environmentally friendly". They could no longer claim that Roundup was "safer than table salt", "practically nontoxic" to mammals, birds and fish, and would not wash off or leach into the soil. They could no longer advertise that, "Roundup can be used where kids and

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[48] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

[49] Wikipedia, 2015. Biodegradation. Wikipedia. Available at: http://en.wikipedia.org/wiki/Biodegradation

pets play and breaks down into natural material."

Similarly, in 2009, the French Supreme Court ruled against Monsanto for falsely advertising its Roundup herbicide.[50] [51]

Monsanto's patent for glyphosate expired outside the USA in 1991 and in the US in 2000. Glyphosate is now produced by many companies in the US and around the world.[52]

The glyphosate market is concentrated with top four players holding more than 50% share. Some of the key manufacturers of glyphosate include Monsanto Company, Nufarm Ltd., Syngenta AG., DowAgroSciences LLC, E. I. du Pont de Nemours and Company, Zhejiang Xinan Chemical Industrial Group Company, Ltd., Jiangsu Good Harvest-Weien Agrochemical Co., Ltd. and Nantong Jiangshan Agrochemical & Chemicals Co., Ltd. among others.[53]

Only Monsanto is bound by the rulings of the New York Attorney General and the French Supreme Court. The other manufacturers of glyphosate are not and could still use inaccurate labels on their glyphosate products.

Moreover, on April 21, 2015, a new class action lawsuit (Case No: BC 578 942) was filed in the Los Angeles County, California against the Monsanto Corporation. The suit alleges that Monsanto is guilty of false advertising by claiming that glyphosate, the active ingredient in Roundup, targets an enzyme only found in plants and not in humans or animals. Monsanto is accused of deliberate falsification to conceal the fact that glyphosate is harmful to humans and animals.

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[50] Feridun, K., 2009. Origins: Roundup. Side Dish. Available at: http://www.goindie.com/dish/index.cfm/origins/article/id/95696549-3833-4BE2-89242AEBA8BEC02E

[51] Wikepedia, 2015. Monsanto Legal Cases. Wikepedia. Available at: https://en.wikipedia.org/wiki/Monsanto_legal_cases

[52] Friends of the Earth, 2013. Introducing Glyphosate, the Worlds Biggest Selling Herbicide. Friends of the Earth. Available at: https://www.foeeurope.org/sites/default/files/press_releases/foee_1_introducing_glyphosate.pdf

[53] Sustainable Pulse, 2014. Glyphosate Herbicide Sales Boom Powers Global Biotech Industry. Sustainable Pulse. Available at: http://sustainablepulse.com/2014/08/21/glyphosate-sales-boom-powers-global-biotech-industry/#.VVedAhedWpq

In the lawsuit, the argument is made that the targeted enzyme, EPSP synthase, is found in the microbiota, which reside in our intestines, and therefore this enzyme is found in humans and animals. It is further stated in the lawsuit that there are many human and animal health problems associated with the disruption of our intestinal microbes.[54]

The complaint for the lawsuit specifically states; "Because it kills-off our gut bacteria, glyphosate is linked to stomach and bowel problems, indigestion, ulcers, colitis, gluten intolerance, sleeplessness, lethargy, depression, Crohn's Disease, Celiac Disease, allergies, obesity, diabetes, infertility, liver disease, renal failure, autism, Alzheimer's, endocrine disruption, and the W.H.O. recently announced glyphosate is 'probably carcinogenic.'"[55]

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[54] Swanson, N., 2015. Monsanto Sued in Los Angeles County for False Advertising. Examiner. Available at: http://www.examiner.com/article/monsanto-sued-los-angeles-county-for-false-advertising#

[55] Superior Court of the State of California, County of Los Angeles, 2015. Case No: BC 578 942 CLASS ACTION: Complaint for Damages Preliminary Injunction, and Permanent Injunction; False and Misleading Advertising [B&P Code 17500]. Available at: http://www.monsantoclassaction.org/wp-content/uploads/2015/04/Monsanto-Glyphosate-Class-Action-4.20.2015.pdf

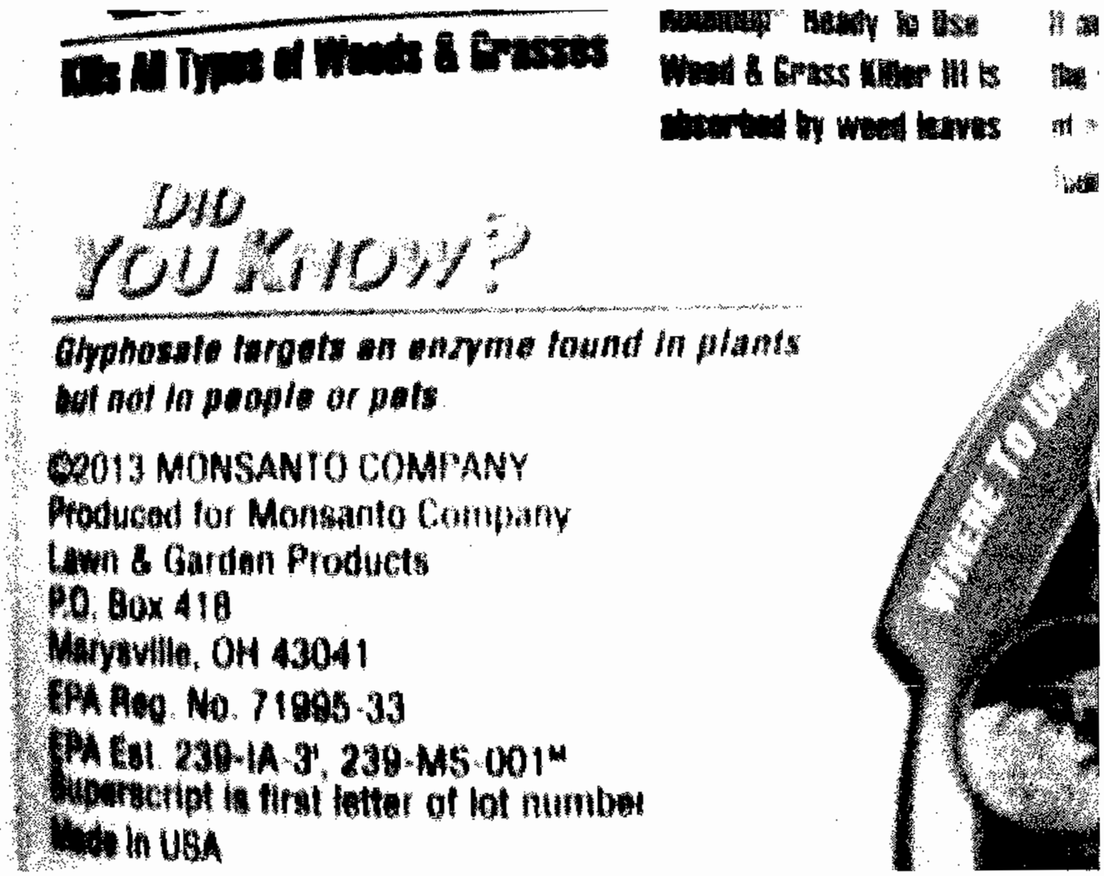

Photo Exhibit by T. Mathew Phillips, Esq. (Attorney representing Plaintiffs in Class Action lawsuit – Elvis Mirzaie, Edison Mirazie, Romi Mirzaie (Plaintiffs) vs. Monsanto Company (Defendants))

Conclusion

With such a history of false advertising and labeling, the Marin County Open Space District and the TPEIR cannot trust labels of commercial glyphosate herbicide formulations to be accurate and provide adequate and safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the TPEIR to "apply herbicides according to label requirements" fails to adequately mitigate "the possibility of hazard through regulation of transport, use and disposal of herbicides". Instead, the Vegetation and Biodiversity Management Plan and the **TPEIR must be revised to mandate new, safer and more robust application requirements for herbicides.**

B. The Draft TPEIR Fails To Adequately Disclose, Analyze And Mitigate Potentially Significant Impacts Related to the Routine Transport, Use, Or Disposal of Hazardous Materials Because The

Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) and Draft TPEIR Is Inadequate

On Page 252, the Draft TPEIR states; "The Project would not create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials due to the following controls:"...
"Implementation of the BMPs (Best Management Practices) listed in the VBMP would reduce the potential for pollution and hazardous exposure to herbicides."[56]

However, the control / mitigation measure described above relies on BMP-Invasive Plant-1 "*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*", which is severely flawed in regard to notification and signage procedures.

On Page 255, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"...
"All Notices of Herbicide Application must be removed **four days** after the application has been made."[57]

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances.

Persistence of glyphosate in soil and water:

Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. Research shows that even when

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[56] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

[57] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 255

glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[58]

A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment. Nomura and Hilton (1977) reported **glyphosate half-lives of up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[59] AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days.[60] [61] In water, glyphosate has a long persistence in sediments.

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[62]. The report reached the following conclusions:

- Half-life in soil of Glyphosate and its metabolite AMPA:
  The half-life of glyphosate in soil was 44 days. The half-life of AMPA in soil was 46 days.
- Half-life in broom leaves that failed to drop to ground:
  Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites, indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches. **REMEMBER study was concluded @ 84 days, so we do**

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58 American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at:
http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html

59 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

60 World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

61 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at:
http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

62 Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

not know how much longer glyphosate would have remained at this site in Marin, but some other examples are below:

Other records of glyphosate persistence include[63 64]:

- 249 days on Finnish agricultural soils;
- Between 259 and 296 days on eight Finnish forestry sites;
- Between one and three years on 11 Swedish forestry sites;
- 335 days on a Canadian forestry site;
- 360 days on three Canadian forestry sites;
- 12 to 60 days in pond water following direct application;
- Glyphosate residues in pond sediment were found 400 days after direct application;
- More than one year in studies of pond sediments in the US.

"The rate of glyphosate degradation in soil correlates with the respiration rate, an estimate of microbial activity. Glyphosate has been found to inhibit growth (at 50ppm) of 59% of randomly selected soil bacteria, fungal, actinomycete, and yeast isolates; of nine herbicides tested, glyphosate was the second most toxic."[65] This infers that with extensive glyphosate use, soil microbes are killed which degrade glyphosate, thus slowing degradation and increasing persistence. Glyphosate is much more persistent in anaerobic soils than aerobic.

Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

Conclusion

The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all

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63 Reviewed by Cox, C., 1995b op cit 12.

64 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

65 Carlisle, SM and Trevors, JT. Glyphosate in the environment. 1988. Water, Air, and Soil Pollution. 39:409-412.

Notices of Herbicide Application to be removed four days after the application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to more than 22 years! **Therefore, the mitigation measure to implement the BMPs listed in the VBMP, which relies on BMP-Invasive Plant-1, fails to mitigate potentially significant environmental impacts** related to the routine transport, use or disposal of hazardous materials and such impacts would remain significant.

Instead, the Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels. In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

IV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS AND HAZARDS TO THE PUBLIC OR THE ENVIRONMENT THROUGH REASONABLY FORESEEABLE UPSET AND ACCIDENT CONDITIONS INVOLVING THE RELEASE OF HAZARDOUS MATERIALS INTO THE ENVIRONMENT

A. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts And Hazards To The Public Or The Environment Through Reasonably Foreseeable Upset and Accident Conditions Involving The Release of Hazardous Materials Into the Environment Because The Mitigation Measure Of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

On Page 252 the Draft TPEIR states; "The Project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment due to the following controls:"… "Herbicides would be applied according to label requirements that are designed to limit accidental conditions and provide mitigating actions for herbicide handlers to take in the event of an accidental spill during routine transport, use, and disposal of herbicides."[66]

The above referenced control is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Conclusion
The Marin County Open Space District and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the Draft TPEIR to "apply herbicides according to label requirements" fails to adequately mitigate "accidental conditions and… the event of an accidental spill during routine transport, use, and disposal of herbicides." Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust application requirements for herbicides.

B. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Siguificant Impacts And Hazards To The Public Or The Environment Through Reasonably Foreseeable Upset and Accident Conditions Involving The Release of Hazardous Materials Into the Environment Because The Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) And The Draft TPEIR Is Inadequate

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[66] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 259

On Page 252, the Draft TPEIR states; "The Project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment due to the following controls:"...
"Implementation of the BMPs listed in the VBMP would reduce the potential for accidentally released hazardous material to reach the public or sensitive natural resources (BMP-Invasive Plant-1, BMP-Invasive Plant-2) to insignificant levels."[67]

However, the control / mitigation measure described above relies on BMP-Invasive Plant-1 "*Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures*", which is severely flawed in regard to notification and signage procedures.

On Page 255, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"...
"All Notices of Herbicide Application must be removed **four days** after the application has been made."[68]

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances.

Persistence in Soil and Water:
Please review **Comment III. B.** of this comment letter, which demonstrates that, depending on conditions, glyphosate and its metabolites can have a long persistence in soil, water and sediments. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[69]

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67 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

68 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 255

69 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

Conclusion

The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all Notices of Herbicide Application to be removed four days after the application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to more than 22 years! Therefore, the mitigation measure to implement the BMPs listed in the VBMP, which relies on BMP-Invasive Plant-1, fails to mitigate and reduce "the potential for accidentally released hazardous material to reach the public or sensitive natural resources". As a result, the draft TPEIR fails to mitigate potentially significant environmental impacts related to reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment and such impacts would remain significant.

Instead, the Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels. In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts And Hazards To The Public Or The Environment Through Reasonably Foreseeable Upset and Accident Conditions Involving The Release of Hazardous Materials Into the Environment Because Herbicides Are Allowed To Be Mixed In The Environment

The Draft TPEIR (Page 170, **Mitigation Measure 5.2-1(b)**) prohibits herbicides to be mixed within 100 feet of any water body, including wetlands yet still allows them to be mixed and possibly released into the environment greater than 100 feet of any water body. Therefore, a risk of Hazardous Materials being released into the environment still exists.

A responsible Best Management Practice (BMP) would prevent the potential release of hazardous materials into the environment due to mixing. Rather than mixing herbicides in the open space environment, mixing should occur off site. This would prevent accidental spills of highly concentrated toxic herbicides requiring immediate remediation in the Open Space environment.

V. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HAZARDOUS EMISSIONS AND THE POTENTIAL FOR EMISSIONS TO DRIFT TO SCHOOL SITES

A. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Hazardous Emissions And the Potential For Emissions To Drift To School Sites Because The Mitigation Measure Of Using Herbicides According To Product Label Instructions Is Rendered Deficient When Labels Are Incorrect And Misleading

On Page 252 the TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not volatile and would be used according to product label instructions by trained personnel that would significantly reduce or eliminate the potential for drift to school sites."[70]

The above referenced mitigation measure of using herbicides according to product label instructions is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

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[70] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

Conclusion
Marin County Open Space and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe use and application instructions. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the TPEIR to "use herbicides according to product label instructions" fails to adequately mitigate hazardous emissions and the potential for emissions to drift to school sites. Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust instructions for herbicides.

B. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Hazardous Emissions And the Potential For Emissions To Drift To School Sites Because The TPEIR Inaccurately States That None Of The Herbicides Proposed For Use Are Considered Hazardous Substances And No Hazardous Waste Would Be Generated During Herbicide Application

On Page 252, the TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not volatile and would be used according to product label instructions by trained personnel that would significantly reduce or eliminate the potential for drift to school sites. None of the herbicides proposed for use are considered hazardous substances according to California Code of Regulations (CCR) Title 8, 339 (Hazardous Substances List). No hazardous waste would be generated during herbicide application."[71]

The above description of the herbicides proposed for use is inadequate and false. As demonstrated in **Comment II. A.** of this comment letter, various independent studies demonstrate that glyphosate is highly and chronically toxic and glyphosate herbicide formulations are even more toxic.

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[71] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

It is negligent for the TPEIR to only consider classifications of the California Code of Regulations (CCR). In March, 2015, the International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen.[72] [73]

The various independent studies outlined in **Comment II. A.**, which demonstrate that glyphosate and glyphosate herbicide formulations are highly and chronically toxic and the IARC's classification of glyphosate as a Group 2A carcinogen establish that glyphosate is a hazardous substance. As such, the TPEIR cannot claim that "no hazardous waste would be generated during herbicide application".[74]

Conclusion

The TPEIR fails to accurately describe glyphosate and commercial glyphosate herbicide formulations, fails to identify glyphosate and glyphosate herbicide formulations as hazardous substances and fails to properly disclose and analyze the hazardous emissions of glyphosate and glyphosate herbicide formulations and the potential for such emissions to drift to school sites. Failure to identify and analyze impacts from hazardous emissions of glyphosate and glyphosate herbicide formulations prevents finding adequate mitigation measures.

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Hazardous Emissions And The Potential For Emissions To Drift To School Sites Due To Methods of Application

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72 Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

73 American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

74 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

Sensitive receptors' inadvertent exposure to hazardous emissions of herbicides can occur depending on the method of application, particularly Rope Wick and Foliar applications, as well as the persistence and drift of products in the environment beyond posted warnings.

For herbicides that can be transmitted through air, like glyphosate, the potential hazard of sensitive receptors' inadvertent exposure at school sites exists when the herbicides are being used along medians near school sites in the County because they can be stirred up by wind and auto travel and then drift to the schools.

If the pesticides did not present a risk to the public and the environment through either use or accident, then there would he no need for the following goal: "…goal of eliminating the use of pesticides"[75] (IPM Ordinance No. 3521)

On Page 252 the Draft TPEIR states; "Implementation of the VBMP would not result in hazardous emissions because the herbicides proposed are generally not **volatile**…"[76] Therefore, the Draft TPEIR assumes that herbicides would not travel through the air and drift to school sites.

However, a study from the U.S. Geological Survey, entitled "Pesticides in Mississippi Air and Rain: A Comparison Between 1995 and 2007", reveals that Roundup herbicide (a glyphosate herbicide formulation) and its toxic degradation byproduct AMPA were found in over 75% of the air and rain samples tested from Mississippi in 2007.[77]

Conclusion

The Draft TPEIR mitigation measures, related to hazardous emissions and the potential for emissions to drift to school sites, fail to disclose the methods of application and falsely presume that using herbicides, such as

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[75] County of Marin Integrated Pest Management Policy and Integrated Pest Management Ordinance No. 3521, adopted by the Board of Supervisors, July 21, 2009.

[76] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 252

[77] Michael S Majewski, Richard H Coupe, William T Foreman, Paul D Capel. Pesticides in Mississippi air and rain: A comparison between 1995 and 2007. Environ Toxicol Chem. 2014 Feb 19. Epub 2014 Feb 19. PMID: 24549493

Glyphosate, will not result in hazardous emissions and be transmitted through the air.

VI. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, EVALUATE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HUMANS' AND ECOLOGICAL RECEPTORS' EXPOSURE TO HERBICIDES BECAUSE ITS "IMPACT EVALUATION APPROACH" IS BASED ON GENERALIZATIONS, OUTDATED SCIENCE AND INCORRECT INFORMATION

A. The Draft TPEIR Fails to Adequately Disclose, Analyze and Mitigate Potentially Significant Impacts Related to Humans' and Ecological Receptors' Exposure to Herbicides Because The Mitigation Measure of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

On page 259 under "**Impact Evaluation Approach**", the Draft TPEIR states; "Under most circumstances, following label requirements and PCA and QAC/QAL guidance is sufficient to reduce the magnitude and likelihood of impacts to insignificant levels."[78]

Please review **Comment III. A.**, **Comment IV. A.**, and **Comment V. A.**, of this comment letter. These comments demonstrate that there is a history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations. Marin County Open Space and the TPEIR cannot trust labels of glyphosate herbicide formulations to be accurate and provide adequate and safe use and application instructions. Indeed, the labels may actually be misleading and provide significant false assurances to Pest Control Advisors and Technicians. The mitigation measure of applying herbicides according to label requirements is rendered deficient when labels are incorrect and misleading.

B. The Draft TPEIR "Impact Evaluation Approach" Fails To Accurately Disclose and Analyze Potentially Significant Impacts

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78 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 259

of Glyphosate and Glyphosate Herbicide Formulations On Non-Plant Receptors

On Page 259 under "**Impact Evaluation Approach**", the Draft TPEIR states; "In general, the use of herbicides does not pose unacceptable risk to humans and ecological receptors. This is because herbicides are designed to be highly selective for plants. That is, the mechanism of action (i.e. the manner in which herbicide products produce the desired effect in plants) is not shared between plants and non-plant receptors, such as human and animals. For example, the active ingredient of an herbicide may exhibit selective toxicity to plants through selective inhibition of an enzyme found exclusively within plants. This specificity generally renders herbicides practically non-toxic to non-plant organisms and significantly contributes to the safety of their use and reduces the likelihood of adverse impacts."[79]

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The above generalization does not apply to glyphosate and glyphosate herbicide formulations. Yet, the Draft TPEIR does not recognize this and treats glyphosate and glyphosate herbicide formulations the same as all other herbicides. We also do not know to what other herbicide products this may apply. How does the County plan to address this?

Please review **Comment II** of this comment letter, which demonstrates that glyphosate and glyphosate herbicide formulations are highly toxic to aquatic organisms, invertebrates, animals and humans.

Toxic effects of glyphosate and glyphosate herbicide formulations found in studies include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, development and reproductive toxicity, malformations, cancer, and neurotoxicity.

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[80], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the

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[79] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 259

[80] European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

shikimate biochemical pathway, which plants have but animals lack.[81] **This is false, as <u>glyphosate also affects other pathways that are present in animals and humans</u>."**[82]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine Disruptors, an effect that can lead to multiple health problems during development and adult life. The endocrine disruptive effects are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time."[83]

The above facts demonstrate that the generalization made on page 259 under "Impact Evaluation Approach" of the TPEIR that the "mechanism of action is not shared between plants and non-plant receptors, such as human and animals" and "renders herbicides practically non-toxic to non-plant organisms and significantly contributes to the safety of their use and reduces the likelihood of adverse impacts"[84] does not apply to glyphosate and glyphosate herbicide formulations. Yet, the TPEIR fails to acknowledge this.

7-08 How does the County plan to mitigate this inadequacy? How does the County plan to protect people from this same type of toxic exposure on any future product chosen?

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[81] European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk

[82] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[83] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

[84] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 259

Conclusion
As demonstrated above and in **Comment II** of this comment letter, the Draft TPEIR fails to adequately identify and evaluate potentially significant impacts because its "Impact Evaluation Approach" is based on generalizations, outdated science and incorrect information.

VII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO HUMAN RECEPTORS' (APPLICATORS AND PRESERVE USERS) EXPOSURE TO HERBICIDES (IMPACT 5.5-2)

A. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Human Receptors' (Applicators and Preserve Users) Exposure to Herbicides (Impact 5.5-2) Because The Mitigation Measure Of Applying Herbicides According To Label Requirements Is Rendered Deficient When Labels Are Incorrect And Misleading

On page 269, under **Impact 5.5-2**, the Draft TPEIR states; "For human receptors, the impact to applicators was evaluated to be no or less-than-significant impact while **following label requirements**, PCA recommendations, and all pertinent BMPs in the draft VBMP."[85]

The above referenced mitigation measure of "following label requirements" is rendered deficient when labels are incorrect and misleading, as is the case of commercial glyphosate herbicide formulations.

Please read our arguments under **Comment III. A.** of this comment letter. The stated arguments and evidence demonstrate that there is a long history and repeated pattern of false advertising and falsification of label texts for glyphosate herbicide formulations.

Conclusion

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[85] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 269

The Marin County Open Space District and the TPEIR cannot trust labels of ANY glyphosate herbicide formulations to be accurate and provide adequate and safe application requirements. Indeed, the labels may actually be misleading and provide significant false assurances to consumers and Pest Control Advisors/Technicians. Therefore, the control and mitigation measure, stated in the Draft TPEIR to "follow label requirements" fails to adequately mitigate impacts related to human receptors' exposure to herbicides. Instead, the Vegetation and Biodiversity Management Plan and the TPEIR must be revised to mandate new, safer and more robust application and use requirements for herbicides.

B. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Human Receptors' (Applicators and Preserve Users) Exposure to Herbicides (Impact 5.5-2) Because The Mitigation Measure Of Implementing the Best Management Practices (BMPs) Listed In The Vegetation And Biodiversity Management Plan (VBMP) And The Draft TPEIR Is Inadequate

On page 269, under **Impact 5.5-2**, the Draft TPEIR states; "For human receptors, the impact to applicators was evaluated to be no or less-than-significant impact while following label requirements, PCA recommendations, and **all pertinent BMPs in the draft VBMP.**"[86] The Draft TPEIR emphasizes following Best Management Practice – BMP-Invasive Plant-1.

The Draft TPEIR further states; "For preserve users, the precautionary measures taken by the MCOSD to inform the public by providing notice at the entry to herbicide treatment sites are considered sufficient to significantly reduce or prevent herbicide exposure to preserve users. This would be a less-than-significant impact."[87]

However, the mitigation measures described above for both applicators and preserve users rely on BMP-Invasive Plant-1 "*Implement an Integrated Pest*

[86] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 269

[87] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 269

Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures", which is severely flawed in regard to notification and signage procedures.

On Page 269, the Draft TPEIR describes BMP-Invasive Plant-1. It states; "For all herbicide use, the Marin County Open Space District (MCOSD) will implement the following procedures:"…
"All Notices of Herbicide Application must be removed **four days** after the application has been made."[88]

When toxic herbicides potentially persist in the environment for years, like glyphosate and its metabolites, removing notices in just four days does little to nothing to protect the public from exposure to the toxic substances.

Persistence in Soil and Water:
Please review **Comment III. B.**, which demonstrates that, depending on conditions, glyphosate and its metabolites can have a long persistence in soil, water and sediments. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[89]

Glyphosate travels through soil, air and water. Residents and pets could be exposed to Glyphosate by walking through public open space and breathing in contaminated airborne dust particles. Children could be exposed while playing on a contaminated field. Children and pets could also be exposed by drinking water from contaminated streams and ponds.

Conclusion
The Best Management Practice - BMP–Invasive Plant-1, of the Vegetation and Biodiversity Management Plan (VBMP) and the Draft TPEIR fails to adequately notify the public of hazardous materials because it requires all Notices of Herbicide Application to be removed four days after the application is made, where as herbicides, like glyphosate, and associated metabolites can persist in the environment for years, even up to more than 22 years! Therefore, the mitigation measures to implement the BMPs listed

[88] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 269
[89] Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

in the VBMP, which rely on BMP-Invasive Plant-1, fail to mitigate the potentially significant environmental impacts related to human receptors' (Applicators and Preserve users) exposure to herbicides (Impact 5.5-2) and such impacts would remain significant.

Instead, the **Vegetation and Biodiversity Management Plan (VBMP) and the TPEIR must be revised to require Notices of Herbicide Application to remain in effect and to prohibit public use of target areas and spray drift areas until herbicides have degraded to non-toxic levels.** In the case of glyphosate and its metabolites, this could be many years. In order to maintain regular access to open space and ensure safe recreational use, the VBMP and the TPEIR should ban the use of glyphosate and glyphosate herbicide formulations in Marin County Open Space District lands.

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, and Mitigate Potentially Significant Impacts Related to Human Receptors' Exposure of Human Receptors to Herbicides (Impact 5.5-2) Because Volunteers Are Not Trained Applicators or Trained to Conduct Management Activities.

The Draft TPEIR (Page 72 "Community Engagement and Volunteerism") states; "The draft VBMP recommends using volunteers for implementing the vegetation management activities."

The Draft TPEIR does not preclude volunteers from any particular vegetation management activity and does not preclude volunteers from being exposed to herbicides. Yet, vegetation management activities include the use of herbicides, which could be hazardous. Furthermore, volunteers could be exposed to herbicides when they pull contaminated weeds or plant new plants in contaminated soils.

Volunteers are not trained applicators and do not necessarily have in depth knowledge of herbicides. Therefore, exposing volunteers to herbicides could be hazardous.

Without specificity of what vegetation management activities the volunteers would partake in or where the volunteers would conduct such vegetation management activities, it is impossible to evaluate whether or not the mitigation measures in the draft TPEIR would reduce the potentially significant impact related to volunteers' exposure to herbicides to less-than-significant.

VIII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO NON-PLANT ECOLOGICAL RECEPTORS (IMPACT 5.5-1)

The Draft TPEIR (Page 264) identifies **Impact 5.5-1**: For non-plant ecological receptors, six of the 28 application scenarios evaluated would result in a significant impact.

The Draft TPEIR (Page 266) then attempts to mitigate Impact 5.5-1 with **Mitigation Measure 5.5-1**:
"In order to reduce impacts associated with herbicide use from activities related to the continued implementation of the VBMP, the MCOSD shall revise BMP-Invasive Plant-2 as follows:

- BMP-Invasive Plant-2 Limit Herbicide Use within 100 feet of sensitive natural resources. Where possible ensure use of least harmful method to conduct vegetation management (e.g. hand control, mechanical control, cultural controls). Where herbicide treatment within a minimum 100-foot buffer is considered essential to control the invasive species and reduce the threat to sensitive natural resources, the MCOSD **will prepare a treatment program**, as called for in BMP-Sensitive Natural Resources-1 to ensure careful controls are fully implemented and conditions adequately monitored.
  NOTE: public needs to see this now and comment on it.
- Within the 100-foot buffer zone, herbicide use is limited through either:
  - Avoiding the use of herbicide entirely within the zone, or
  - Restricting herbicide to targeted application methods, such as foliar spot spray applications. Options on the extent, specific herbicides(s), and application method(s) **will be reviewed in the treatment program**, and recommendations made for preferred treatment based on site specific conditions, threats, and benefits to the sensitive natural resource, and latest adaptive

management practices…"[90]

Mitigation Measure 5.5-1 fails to mitigate Impact 5.5-1 because it defers analysis to a future date. The mitigation measure calls for preparing treatment program(s) in the future and reviewing options on the extent, specific herbicides and application methods in the future. There is no specificity given now about the treatment program(s) or the herbicide application options. Therefore, the public and decision makers are unable to presently determine whether or not Mitigation Measure 5.5-1 would reduce impacts, associated with herbicide use from activities related to the continued implementation of the VBMP, to less-than-significant.

The Draft TPEIR's approach undermines CEQA. The Marin County Open Space District may not defer thorough analyses. "CEQA advances a policy of requiring an agency to evaluate the environmental effects of a project *at the earliest possible stage* in the planning process."[91] The entire point of the CEQA process is to offer the public and the decision makers the opportunity to weigh-in on a project's potentially significant impacts and an agency's proposed measures to mitigate those impacts. It is well established that CEQA is not meant to be a post hoc rationalization of decisions that have already been made.

IX. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO WATER QUALITY STANDARDS OR WASTE DISCHARGE REQUIREMENTS ASSOCIATED WITH THE USE OF HERBICIDES AND THEIR DEGRADATION PRODUCTS (IMPACT 5.2-1)

The Draft TPEIR (Page 30) describes **Impact 5.2-1; "5.2-1 Water Quality Standards or Waste Discharge Requirements.** – Herbicide application could occur when rainfall and stormwater runoff could mobilize herbicides and/or their by-products and convey them to ponds, lakes or creeks. This has the potential to be a significant impact on water quality standards as set forth

[90] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 266

[91] City of Redlands v. County of San Bernardino (2002) 96 Cal.App.4th 398, 410.

in the NPDES General Permit and the Diazinon and Pesticide Toxicity in Urban Creeks TMDL described in the Bay Basin Plan."[92]

A. The Draft TPEIR Fails To Adequately Mitigate Impact 5.2-1 Because Mitigation Measure 5.2-1 Incorporates Mitigation Measure 5.5-1 And Mitigation Measure 5.5-1 Defers Analysis

The DRAFT TPEIR attempts to mitigate Impact 5.2-1 by implementing Mitigation Measure 5.2-1. Mitigation Measure 5.2-1 begins by stating "Implement Mitigation Measure 5.5-1".[93]

Please see **Comment VIII** of this comment letter, which illustrates the inadequacy of Mitigation Measure 5.5-1.

Mitigation Measure 5.5-1 defers analysis:
Mitigation Measure 5.5-1 fails to mitigate Impact 5.5-1 because it defers analysis to a future date. The mitigation measure calls for preparing treatment program(s) in the future and reviewing options on the extent, specific herbicides and application methods in the future. There is no specificity given now about the treatment program(s) or the herbicide application options. Therefore, the public and decision makers are unable to presently determine whether or not Mitigation Measure 5.5-1 would reduce impacts, associated with herbicide use from activities related to the continued implementation of the VBMP, to less-than-significant.

Mitigation Measure 5.5-1 fails to mitigate Impact 5.2-1 for the same reasons it fails to mitigate Impact 5.5-1.

B. The Draft TPEIR's Mitigation Measure 5.2-1 And Mitigation Measure 5.5-1 Fail To Mitigate Potentially Significant Impacts Related To Water Quality Within A 100-Foot Buffer

Mitigation Measure 5.5-1 allows for herbicide treatment within a minimum 100-foot buffer when it is considered essential to control the invasive species

[92] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 30
[93] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 30

and reduce the threat to sensitive natural resources.[94]

However, the Draft TPEIR (page 171) states: "The 100' buffer would provide for substantial degradation or sequestering of any herbicide ingredients or byproducts through both soil, plant/litter and water contact. Herbicides degrade more quickly where the dissolved ingredient comes into contact with soil under both overland flow and soil infiltration scenarios. Moreover, the absorption (i.e. hydrochemical binding) of these ingredients is enhanced as the clay content increases."[95]

If the 100' buffer is necessary for substantial degradation or sequestering of any herbicide ingredients or byproducts through both soil, plant/litter and water contact, then herbicide usage should not be allowed within the 100' buffer.

The Adopted Basin Plan Amendment issued by the RWQCB (2007) states: "All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species."[96]

C. The Draft TPEIR's New Best Management Practices (BMPs) Addressing Water Quality Impacts Are Totally Inadequate

The Draft TPEIR (Page 171) states; "The new BMPs addressing water quality impacts would **reduce** the potential for herbicides to migrate through surface water and groundwater to sensitive water bodies." [97]

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[94] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 266

[95] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 171

[96] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 168

[97] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 171

These potential detrimental effects of migration of unspecified herbicides and their by-products should be prevented rather than 'reduced' and monitored after their adverse impact. Additionally the BMPs do not disclose or analyze the characteristics and deleterious effects of specific adjuvants and the degraded products. Furthermore, as discussed in **Comment II** of this comment letter, glyphosate herbicide formulation labels with aquatic approval may be unreliable.

X. THE DRAFT TPEIR FAILS TO DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO DEGRADED WATER QUALITY AND SUBSTANTIAL ADDITIONAL SOURCES OF POLLUTED RUNOFF (IMPACT 5.2-3)

The Draft TPEIR (Page 175) describes **Impact 5.2-3 "Degraded Water Quality and Substantial Additional Sources of Polluted Runoff";** "Section 5.5 Hazards – Herbicide Use presents a semi-quantitative to qualitative risk screening analysis of ecotoxicity for selected plant, insect, and animal receptors for a list of herbicides potentially approved by MCOSD. The results of that analysis indicate that foliar herbicide applications following concentration limits specified on the labels of assess brand name products would result in significant impacts to aquatic-phase amphibian, fish, aquatic invertebrate, terrestrial insect, and preserve user exposures, originating as either ingestion and/or dermal absorption. Given these assessed toxicities, and the potential for wet season herbicide applications within 100 feet of creeks, rivers, ponds, springs and seeps, surface runoff and/or degraded groundwater discharge, project implementation could result in substantial additional sources of polluted runoff reaching these sensitive water resources within the preserve areas. This would be a significant impact."

Mitigation Measure 5.2-1 attempts to reduce the project impact (Impact 5.2-3) on the quality of stormwater runoff by asserting "restrictions on timing, conditions and types of herbicides".[98]

However, the mitigation measure does not address the methods of application or the characteristics or impact of degradation by-products. It

[98] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 176

does not define when it would be "necessary to secure the expertise of biologists, herbicide specialists and /or water quality professionals to interpret conditions and to determinate risks to specific animal or insect receptors"[99]

In conclusion, the Draft TPEIR fails to adequately address potentially significant impacts related to polluted stormwater runoff.

XI. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO DABBING AND CUT STUMP APPLICATION OF HERBICIDES

The Draft TPEIR (Page 247) describes the application method used by MCOSD to apply herbicides called "Cut Stump Application" as follows; "Cut stump applications are highly targeted applications where herbicide is applied with a paint-brush, wick applicator or low volume sprayer to the stump of a cut down tree. To be effective, treatments are typically made shortly (within an hour) after the tree is cut down to prevent the tree's vascular system from sealing off."[100]

7-09 **The TPEIR fails to mention that the "Cut Stump Application" method is also used on tall shrubs with thick stems, like Broom. The TPEIR also fails to mention that dabbing an herbicide with a paintbrush, wick applicator or sponge uses a much higher concentration of an herbicide than spraying.**
This is a serious inadequacy, and smacks of being done on purpose.

Don Huber PhD (Emeritus Professor of Plan Pathology at Purdue University) and Bob Streit (Crop, Seed, Technology and Soil remediation Consultant) gave a lecture in 2014 about the risks of using Glyphosate in Marin County, particularly in the Marin Municipal Water District (MMWD) watershed. Both experts examined the MMWD Wildlife Protection and Habitat Improvement Plan and walked through the MMWD watershed. In particular, they examined the invasion of Broom in the watershed. The

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[99] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015:Pg. 176
[100] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015:Pg. 247

application technique for controlling Broom, highlighted by MMWD Representatives to Dr. Huber and Mr. Streit, was to cut the stems of the Broom and then sponge dab a glyphosate herbicide formulation to the remaining stumps of the shrub.

Dr. Don Huber explained and Bob Streit agreed that dabbing typically uses a much higher concentration of Glyphosate than spraying. Therefore, when dabbing weeds, the amount of Glyphosate per acre would be similar to the amount typically used when spraying BUT the amount entering the soil at a particular site would be much greater!

When applied to a weed, an herbicide, like Glyphosate and Glyphosate Herbicide Formulations, does not remain on the exterior of the weed but is absorbed into the weed's tissues and travels down into the root system. The herbicide then travels from the root system of the targeted weed into the soil where it can be picked up by adjacent roots of beneficial non-target plants and trees, ultimately killing them. The more concentrated the herbicide is at a particular site (which results from dabbing and Cut Stump Applications), the greater the impact on neighboring non-target plants and trees.

The Draft TPEIR fails to disclose, analyze and mitigate potentially significant impacts related to high concentrations of herbicides at particular sites where the herbicides would be applied using the application method of dabbing and Cut Stump Application.

7-10

XII. THE DRAFT TPEIR FAILS TO SATISFY CEQA REQUIREMENTS BECAUSE IT IMPROPERLY DEFERS THE DISCLOSURE, ANALYSIS AND MITIGATION OF POTENTIALLY SIGNIFICANT IMPACTS

This is perhaps the most objectionable failure of the documents, as it seems to be a way to avoid disclosing impacts which could/would not be mitigatable.

The Marin County Open Space District may not defer thorough analyses. "CEQA advances a policy of requiring an agency to evaluate the environmental effects of a project *at the earliest possible stage* in the planning process."[101]

[101] City of Redlands v. County of San Bernardino (2002) 96 Cal.App.4th 398, 410.

CEQA requires the County to adopt feasible mitigation measures that will substantially lessen or avoid the Project's potentially significant environmental impacts.[102] A public agency may not rely on mitigation measures of uncertain efficacy or feasibility.[103] "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.[104] Mitigation measures must be fully enforceable through permit conditions, agreements or other legally binding instruments.[105]

Yet, in order to mitigate numerous potentially significant environmental impacts, the DRAFT TPEIR recommends mitigation measures that would be designed in the future. Designing and determining the specifics of a mitigation measure in the future does not allow the public or decision makers to evaluate the measures now and presently determine whether or not they are feasible.

A. The Draft TPEIR Fails To Satisfy CEQA Requirements Because It Improperly Defers The Analysis And Mitigation Of Potentially Significant Impacts Related To Special-Status Species, Sensitive Natural Communities, Plus Wetlands And Other Waters

The Draft TPEIR (Pg. 45, Section 5.1 "**Biological Resources**") lists the TPEIR's major conclusions and states; "Management activities implemented consistent with the VBMP could result in significant impacts to special-status species, sensitive natural communities, plus wetlands and other waters." [106]

One of the mitigation measures recommended to reduce the identified impacts to a less-than-significant level is the "preparation of a treatment program where management activities would occur within a minimum 100 foot buffer of sensitive natural resources. The treatment program would evaluate options for treatment and risk to sensitive natural resource, define a preferred treatment plan, identify controls for avoiding and minimizing

[102] Pub. Resources Code, §§ 21002, 21081(a).
[103] Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692, 727.
[104] CEQA Guidelines, § 15364.
[105] CEQA Guidelines, § 15126.4(a)(2).
[106] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 45

potential adverse effects on the sensitive natural resource and include requirements for construction and post-construction monitoring. Where necessary, compensatory mitigation for unavoidable adverse effects on sensitive natural resources would be required."[107]

The above mitigation measure is inadequate. As described, the treatment program is to be prepared in the future, thereby disallowing any ability to evaluate its adequacy now. There is no specificity about how treatment program and controls would accomplish a less-than-significant impact especially when activities are allowed to occur within the 100' buffer. There is no clarity as to how or whether compensation would/can be made and there is admission of potential unavoidable adverse impacts if management activities are conducted.

B. The Draft TPEIR Fails To Satisfy CEQA Requirements Because It Improperly Defers The Disclosure, Analysis and Mitigation Of Potentially Significant Impacts Related to Herbicide Products Selected In The Future

The Draft TPEIR (Page 257, "**Application Scenarios**") states; "In addition to the products analyzed, the results of this screening analysis were considered equally applicable to any substantially similar product that the MCOSD may wish to use. Substantially similar products are products that are considered sufficiently similar in composition and methods of application such that the risk results generated for one product are considered equally relevant to the use of any other product sharing one or more substantially similar features. Substantial similarity between two products may be concluded **based on one** or more of the following features:

- Similar product formulation including similar or identical active and inert ingredients and percent composition thereof;
- Similarities in the methods of application, including equipment, rates, location, and timing;
- Similarities in use or lack of use of adjuvants."[108]

[107] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 45
[108] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 257

The Draft TPEIR's method for determining whether or not two products are similar would allow a more highly toxic formulation or more powerful adjuvants to be used with a different product name or producer as long as the method of application is the same.

7-11 THIS IS OUTRAGEUOS, and highlights the inadequate thinking and deceptive character of these documents.

Furthermore, selecting herbicides in the future precludes the ability to adequately disclose, analyze and mitigate potentially significant environmental impacts related to the herbicides now.

7-12 ALSO, it precludes using new research/studies to inform decisions and the public.

Conclusion

The Draft TPEIR's approach undermines the entire point of the CEQA process -- to offer the public and the decision makers the opportunity to weigh-in on a project's potentially significant impacts and an agency's proposed measures to mitigate those impacts. It is well-established that CEQA is not meant to be a post hoc rationalization of decisions that have already been made. "If post-approval environmental review were allowed, EIR's would likely become nothing more than post hoc rationalizations to support action already taken."[109]

XIII. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO ADJUVANTS

The Draft TPEIR fails to identify, analyze and mitigate potentially significant impacts related to adjuvants – the solvents, preservatives, surfactants and other substances that manufacturers add to pesticides. Yet, adjuvants can be extremely toxic by themselves and dramatically amplify the toxicity of the main active ingredient of an herbicide. Complete herbicide formulations are many times more toxic than their isolated active ingredients.

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson,

109 Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 394.

MPhil; "In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[110],[111] The "GMO Myths and Truths" report referred to the in vitro study entitled; "Major Pesticides Are More Toxic to Human Cells Than their Declared Active Principles"[112] by Mesnage, Defarge, Vendomois, and Seralini. The study tested the following pesticides: Glyphosate, isoproturon, fluroxypyr, pirimicarb, imidacloprid, acetamiprid, tebuconazole, epoxiconazole, and prochloraz constitute, respectively, the active principles of 3 major herbicides, 3 insecticides, and 3 fungicides. The in vitro study also found that "Chronic tests on pesticides may not reflect relevant environmental exposures if only one ingredient of these mixtures is tested alone."

"Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[113] "The added ingredients (adjuvants) are toxic[114] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[115] [116] [117],[118]

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110 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955666/

111 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

112 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955666/

113 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

114 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

115 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105. doi:10.1021/tx800218n.

116 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33.

In June 2009, Scientific American published an article by Crystal Gammon and Environmental Health News entitled; "Weed-Whacking Herbicide Proves Deadly to Human Cells". The article is about a 2008 research study by Nora Benachour and Gilles-Eric Seralini, molecular biologists at University of Caen, France, entitled; "*Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells*"[119]. The research study appears in the January 2009 Journal Chemical Research in Toxicology. Benachour and Seralini "found that Roundup's inert ingredients amplified the toxic effect on human cells—even at concentrations much more diluted than those used on farms and lawns."[120]

POEA (polyethoxylated tallowamine) is a surfactant, or detergent, derived from animal fat. It is added to Roundup and other herbicides to help them penetrate plants' surfaces, making the weed killers more effective.

According to Crystal Gammon; "Researchers Benachour and Seralini tested four different Roundup formulations, all containing POEA and glyphosate at concentrations below the recommended lawn and agricultural dose. They also tested POEA and glyphosate separately to determine which caused more damage to embryonic, placental and umbilical cord cells."[121]

Seralini's team studied multiple concentrations of Roundup, which "ranged from the typical agricultural or lawn dose down to concentrations 100,000 times more dilute than the products sold on shelves. The researchers saw cell

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doi:10.1002/ps.539.

117 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

118 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

119 Benachour, N. Seralini, G. Glyphosate Formulations Induce Apoptosis and Necrosis in Human Ubilical, Embryonic, and Placental Cells. 2008. American Chemical Society. Available at: http://pubs.acs.org/doi/abs/10.1021/tx800218n

120 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

121 Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

damage at all concentrations."[122]

Benachour and Seralini demonstrated that "Glyphosate, POEA and all four Roundup formulations damaged all three cell types (embryonic, placental and umbilical cord cells). Umbilical cord cells were especially sensitive to POEA. Glyphosate became more harmful when combined with POEA, and POEA alone was more deadly to cells than glyphosate." – a finding the researchers call "astonishing."[123]

"This clearly confirms that the inert ingredients in Roundup formulations are not inert," wrote Benachour and Seralini, "Moreover, the proprietary mixtures available on the market could cause cell damage and even death at the residual levels found on Roundup-treated crops, such as soybeans, alfalfa and corn, or lawns and gardens."[124]

Similarly, the study entitled; "*Differential Effects of Glyphosate and Roundup on Human Placental Cells and Aromatase*" by Sophie Richard, Safa Moslemi, and Gilles-Eric Seralini (June 2005) noted that: "Surprisingly, Roundup is always more toxic than its active ingredient (glyphosate)"... and that "...the presence of Roundup adjuvants enhances glyphosate bioavailability and/or bioaccumulation."[125]

Conclusion

Adjuvants have been proven to be extremely toxic by themselves and to dramatically amplify the toxicity of the main active ingredient of an herbicide. Complete herbicide formulations are up to 1000 times the toxicity of their isolated active ingredients.

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[122] Gammon, C. 2009. Weed killer kills human cells. Study intensifies debate over 'inert' ingredients. Environmental Health News. Available at: http://www.environmentalhealthnews.org/ehs/news/roundup-weed-killer-is-toxic-to-human-cells.-study-intensifies-debate-over-inert-ingredients

[123] Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

[124] Gammon, C. Environmental Health News. 2009. Weed-Whacking Herbicide Proves Deadly to Human Cells. Scientific American. Available at: http://www.scientificamerican.com/article/weed-whacking-herbicide-p/

[125] Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15929894

MCOSD must return with a revised Draft TPEIR that discloses, analyzes, and mitigates potentially significant impacts related to the adjuvants of all the herbicides proposed to be used in MCOSD lands. Such disclosure, analysis and mitigations should pertain to each adjuvant by itself and also in combination with other adjuvants and with the main active ingredients of the proposed herbicides. In addition, since multiple herbicides could be applied to the same or adjacent locations, the potential significant impacts related to the combination of the various proposed herbicide formulations should also be addressed.

XIV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT CUMULATIVE IMPACTS RELATED TO HERBICIDE USE

A. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant Cumulative Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicides Degrade Rapidly

The Draft TPEIR (Page 364) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: herbicide degradation…"[126]

"**Herbicide Degradation**: Past herbicide use is unlikely to contribute significantly to adverse cumulative impact as **herbicides degrade rapidly** in the environment."[127]

7-13 This statement is patently untrue, and further example of author's attempt to avoid public scrutiny.

However, the above Draft TPEIR statement pertaining to herbicide degradation is false in regard to Glyphosate, Glyphosate Herbicide Formulations and Glyphosate's metabolites.

Persistence of glyphosate in soil and water:

[126] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 364

[127] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 364

Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. Research shows that even when glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[128]

A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils with pH<6 and organic matter contents of over 90 g kg^{-1}.[129] AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days.[130] [131] In water, glyphosate has a long persistence in sediments.

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[132]. The report reached the following conclusions:

- Half-life in soil of Glyphosate and its metabolite AMPA:
  The half-life of glyphosate in soil was 44 days. The half-life of AMPA in soil was 46 days.
- Half-life in broom leaves that failed to drop to ground:
  Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites,

[128] American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at:
http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html
[129] Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.
[130] World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.
[131] Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at:
http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf
[132] Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches.

Other records of glyphosate persistence include[133] [134]:

- 249 days on Finnish agricultural soils;
- Between 259 and 296 days on eight Finnish forestry sites;
- Between one and three years on 11 Swedish forestry sites;
- 335 days on a Canadian forestry site;
- 360 days on three Canadian forestry sites;
- 12 to 60 days in pond water following direct application;
- Glyphosate residues in pond sediment were found 400 days after direct application;
- More than one year in studies of pond sediments in the US.

As demonstrated above, glyphosate, glyphosate herbicide formulations and glyphosate's metabolites can persist for a very long time. Under certain conditions, Glyphosate can persist for longer than 22 years!

Therefore, the TPEIR fails to acknowledge that herbicides like glyphosate and its metabolites may NOT degrade rapidly but rather could degrade very slowly. Because of this potential slow degradation rate, environmental concentrations of glyphosate and its metabolites may remain for long periods. The TPEIR further fails to acknowledge that herbicides considered in the VBMP (particularly glyphosate, glyphosate herbicide formulations and related metabolites) are likely to be exposed to sensitive receptors and accumulate in the environment. The TPEIR fails to acknowledge that past herbicide use could contribute significantly to adverse cumulative impacts.

B. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant Cumulative Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicide Applications Do Not Overlap In Location and Time

[133] Reviewed by Cox, C., 1995b op cit 12.

[134] Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

The Draft TPEIR (Page 365) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: … localized nature of herbicide applications…"[135]

"**Localized Nature of Herbicide Applications**: In addition to natural degradation, past, present, and future herbicide use is unlikely to contribute significantly to a significant adverse cumulative impact due to the localized nature of herbicide applications. Invasive plant treatment areas are not usually contiguous or **overlapping in location and time**. This lack of overlap significantly reduces the likelihood that multiple herbicide applications would have a cumulative contribution towards an impact." [136]

However, the above Draft TPEIR statement pertaining to the localized nature of herbicide applications is false in regard to Glyphosate and Glyphosate Herbicide Formulations.

7-14

Not only that, it is false in regard to previous plans and actions which call for year after year herbicide application until the plant is truly killed and its seeds no longer produce new plants.

Persistence of glyphosate in soil and water:
Glyphosate's toxicity is compounded by its persistence in the environment. Many studies show that glyphosate remains, chemically unchanged in the environment for long periods of time. Research shows that even when glyphosate binds to soil particles, it will cyclically "desorb" or lose its attraction to soil and become active as an herbicide.[137]

A number of studies have shown that, depending on conditions, Glyphosate and its metabolites can persist for many years in the environment. Nomura and Hilton (1977) reported glyphosate half-lives of **up to 22 years** in soils

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135 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 365

136 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 365

137 American Bird Conservancy, Pesticide Profile – Glyphosate. American Bird Conservancy. Available at: http://www.abcbirds.org/abcprograms/policy/toxins/profiles/glyphosate.html

with pH<6 and organic matter contents of over 90 g kg^{-1}.[138] AMPA, a major metabolite of glyphosate, has also been found to be very persistent, with a half-life in soil between 119 and 958 days.[139] [140] In water, glyphosate has a long persistence in sediments.

Hun-Min Hwang and Thomas M. Young Environmental Quality Laboratory Department of Civil and Environmental Engineering, University of California, Davis prepared a report for MMWD about MMWD watershed lands entitled; "Final Report - Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration"[141]. The report reached the following conclusions:

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  Concentrations of glyphosate in broom leaves didn't exhibit significant changes over the 84 days of study period for the both sites, indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches.

Other records of glyphosate persistence include[142] [143]:

- 249 days on Finnish agricultural soils;
- Between 259 and 296 days on eight Finnish forestry sites;
- Between one and three years on 11 Swedish forestry sites;

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138 Nomura, N.S., Hilton, H.W., 1977. The adsorption and degradation of glyphosate in five Hawaiian sugarcane soils. Weed Res. 17:113–121.

139 World Health Organization (WHO), 1994. Glyphosate. Environmental Health Criteria 159. The International Programme on Chemical Safety (IPCS). WHO, Geneva.

140 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

141 Hwang, H., Young, T., 2011. Final Report – Environmental Decay of Glyphosate in Broom-infested Bt. Tamalpais Soils and Its Transport Through Stormwater Runoff and Soil Column Infiltration. Environmental Quality Laboratory Dept. of Civil and Environmental Engineering, University of California, Davis.

142 Reviewed by Cox, C., 1995b op cit 12.

143 Buffin, D., Jewell, T., 2001. Health and Environmental Impacts of Glyphosate. Pesticide Action Network UK. Available at: http://www.foe.co.uk/sites/default/files/downloads/impacts_glyphosate.pdf

- 335 days on a Canadian forestry site;
- 360 days on three Canadian forestry sites;
- 12 to 60 days in pond water following direct application;
- Glyphosate residues in pond sediment were found 400 days after direct application;
- More than one year in studies of pond sediments in the US.

As demonstrated above, glyphosate, glyphosate herbicide formulations and glyphosate's metabolites can persist for a very long time. Under certain conditions, Glyphosate can persist for longer than 22 years!

At numerous preserves (E.g. the Ring Mountain Preserve), the MCOSD has applied glyphosate in the same location each year for contiguous years. Since glyphosate and glyphosate's metabolites can persist for a year or multiple years, depending on conditions, such repeated yearly applications of glyphosate or glyphosate herbicide formulations could result in the applications overlapping in location and time. This overlap significantly increases the likelihood that multiple herbicide applications would accumulate and have a cumulative contribution towards an impact.

The Draft TPEIR fails to recognize the long persistence of glyphosate, glyphosate herbicide formulations, and glyphosate's metabolites. The Draft TPEIR fails to recognize that repeated yearly applications of glyphosate and glyphosate formulations could result in applications overlapping in location and time. Therefore, the Draft TPEIR fails to adequately disclose, analyze, and mitigate potentially significant cumulative impacts related to herbicide use.

C. The Draft TPEIR Fails To Adequately Disclose, Analyze, And Mitigate Potentially Significant Cumulative Impacts Related To Herbicide Use Because the Draft TPEIR Incorrectly Assumes That All Herbicide Applications Are Low In Toxicity And That The Mechanism of Action Of Herbicides Would Not Impact Non-Plant Receptors Such As Humans and Animals

The TPEIR (Page 365) states; "As described below, there are several factors that reduce the potential for significant cumulative impacts from the use of herbicides. These factors include: ... Low Toxicity of Herbicides to

Animals an Humans…"[144]

"**Low Toxicity of Herbicides to Animals and Humans**: Another factor reducing the likelihood of impact is the low toxicity and high specificity of herbicides. In general, the mechanisms of action of herbicides tend to be highly selective. That is, the mechanism of action is not shared between plants and non-plant receptors such as humans and animals. For example, the active ingredient of an herbicide may exhibit selective toxicity to plants through selective inhibition of an enzyme found only in plants. This specificity generally renders herbicides practically non-toxic to non-plant organisms and significantly reduce the likelihood of adverse cumulative impacts resulting from repeated or aggregate exposure to herbicides."[145]

However, the above TPEIR statement pertaining to the toxicity of herbicides to animals and humans is false in regard to Glyphosate and Glyphosate Herbicide Formulations. This concern also is bound to apply to other herbicides that have not been as carefully and independently tested as glyphosate. Therefor the TPEIR must be considered inadequate until these same tests are preformed on all potential candidate herbicides.

7-15

It is also false in regards to Health & Habitat's comments on page three:

7-16

In the area of the human health risks, documents fail to adequately account for impacts on vulnerable populations including elderly, infants, women, and people with pesticide allergies. One aspect of this is the impact of low doses of pesticides. See paper referenced below, and respond to this.

An area of H&H's concern – endocrine disruption – has not been Satisfactorily addressed, especially as relates to low dose effects and nonmonotonic dose responses, making the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report inadequate and deficient.

7-17

144 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 365

145 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 365

7-17 (cont.)

Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses

Endocrine Reviews, June 2012, 33(3):0000–0000 edrv.endojournals.org 1

Laura N. Vandenberg, Theo Colborn, Tyrone B. Hayes, Jerrold J. Heindel, David R. Jacobs, Jr., Duk-Hee Lee, Toshi Shioda, Ana M. Soto, Frederick S. vom Saal, Wade V. Welshons, R. Thomas Zoeller, and John Peterson Myers

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"For decades, studies of endocrine-disrupting chemicals (EDCs) have challenged traditional concepts in toxicology, in particular the dogma of "the dose makes the poison," because EDCs can have effects at low doses that are not predicted by effects at higher doses. Here, we review two major concepts in EDC studies: low dose and nonmonotonicity. Low-dose effects were defined by the National Toxicology Program as those that occur in the range of human exposures or effects observed at doses below those used for traditional toxicological studies. We review the mechanistic data for low-dose effects and use a weight-of-evidence approach to analyze five examples from the EDC literature. Additionally, we explore nonmonotonic dose-response curves, defined as a nonlinear relationship between dose and effect where the slope of the curve changes sign somewhere within the range of doses examined. We provide a detailed discussion of the mechanisms responsible for generating these phenomena, plus hundreds of examples from the cell culture, animal, and epidemiology literature. We illustrate that nonmonotonic responses and low-dose effects are remarkably common in studies of natural hormones and EDCs. Whether low doses of EDCs influence certain human disorders is no longer conjecture, because epidemiological studies show that environmental exposures to EDCs are associated with human diseases and disabilities. We conclude that when nonmonotonic dose-response curves occur, the effects of low doses cannot be predicted by the effects observed at high doses. Thus, fundamental changes in chemical testing and safety determination are needed to protect human health." (Endocrine Reviews 33: 0000–0000, 2012)

The TPEIR will be deficient and inadequate until and unless it fully addresses hormones and endocrine-disrupting chemicals - low-dose effects and nonmonotonic dose responses

1. The Draft TPEIR Fails To Acknowledge That Glyphosate Is Highly And Chronically Toxic And Commercial Glyphosate Herbicide Formulations Are More Toxic

Please review **Comment II** of this comment letter, which demonstrates that glyphosate and glyphosate herbicide formulations are highly toxic to aquatic organisms, invertebrates, animals and humans.

Independent studies show that glyphosate, the active ingredient in glyphosate herbicide formulations identified for use in the Vegetation and Biodiversity Management Plan (AquaMaster, Rodeo, and Roundup Custom), is highly and chronically toxic.

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Commercial glyphosate herbicide formulations contain extra added ingredients (adjuvants) and are more toxic than glyphosate alone."[146] "The added ingredients (adjuvants) are toxic[147] and increase the toxicity of glyphosate by enabling it to penetrate plant and animal cells more easily, making it more bioavailable.[148] [149] [150],,[151]

"In an in vitro study, eight out of nine major pesticides tested in vitro in their complete formulations, including Roundup, were up to 1,000 times more

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146 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

147 Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. Toxicol Rev. 2004;23:159–167.

148 Benachour N, Séralini GE. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem Res Toxicol. 2009;22:97–105. doi:10.1021/tx800218n.

149 Haefs R, Schmitz-Eiberger M, Mainx HG, Mittelstaedt W, Noga G. Studies on a new group of biodegradable surfactants for glyphosate. Pest Manag Sci. 2002;58:825-33. doi:10.1002/ps.539.

150 Richard S, Moslemi S, Sipahutar H, Benachour N, Seralini GE. Differential effects of glyphosate and Roundup on human placental cells and aromatase. Env Health Perspect. 2005;113:716-20.

151 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

toxic to human cells than their isolated active ingredients. This increased toxicity of the complete formulation compared with the active ingredient alone was found to be a general principle of pesticide toxicology.[152,153]

2. The Draft TPEIR Fails To Acknowledge That Glyphosate And Glyphosate Herbicide Formulations Are Highly And Chronically Toxic To Animals And Humans:

In March 2015, the International Agency for Research on Cancer, part of the World Health Organization (WHO), determined that glyphosate is probably carcinogenic to humans and probably causes cancer in humans and therefore classified the herbicide as a Group 2A carcinogen.[154 155]

According to the report "GMO Myths and Truths – Edition 2" by genetic engineers John Fagan, PhD, Michael Antoniou, PhD, and Claire Robinson, MPhil; "Toxic effects of glyphosate and Roundup include disruption of hormonal systems and beneficial gut bacteria, damage to DNA, developmental and reproductive toxicity, birth defects, cancer, and neurotoxicity."[156]

"Roundup and other glyphosate herbicide formulations (E.g. AquaMaster, Rodeo, and Roundup Custom) have never been tested or assessed for long-term safety for regulatory purposes. Only glyphosate alone was tested. Even the industry tests on glyphosate alone revealed toxic effects, including

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152 Mesnage R, Defarge N, de Vendomois JS, Séralini GE. Major pesticides are more toxic to human cells than their declared active principles. BioMed Res Int. 2014;2014. doi:10.1155/2014/179691.

153 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:206-207. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

154 Bunge, J., Health Agency Says Widely Used Herbicide Likely Carcinogenic. Wall Street Journal. 2015. Available at: http://www.wsj.com/articles/health-agency-says-widely-used-herbicide-likely-carcinogenic-1426885547

155 American Cancer Society, Known and Probable Human Carcinogens. American Cancer Society. 2015. Available at: http://www.cancer.org/cancer/cancercauses/othercarcinogens/generalinformationaboutcarcinogens/known-and-probable-human-carcinogens

156 Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

malformations[157]."[158]

Based on outdated and unpublished studies on the isolated ingredient glyphosate, commissioned by manufacturers in support of their application for regulatory authorization[159], the GMO and Pesticide industry authors claim that glyphosate and glyphosate herbicide formulations are non-toxic to animals and humans because glyphosate's sole mechanism of toxicity is the shikimate biochemical pathway, which plants have but animals lack.[160] This is false, as glyphosate also affects other pathways that are present in animals and humans.[161]

"Glyphosate and Roundup have been found to interfere with the retinoic acid signaling pathway, which affects gene expression in animals and humans. When disrupted, it can result in the development of malformations. Glyphosate and Roundup negatively affect gut bacteria that are vital to the healthy functioning of the immune system. Glyphosate is a chelator of essential nutrient metals, making them unavailable to the plant and therefore to the consumer. Glyphosate and Roundup are endocrine disruptors, an effect that can lead to multiple health problems during development and adult life.

The endocrine disruptive effects are most worrying, as they manifest at very low doses and can lead to ill health when exposure takes place over long periods of time."[162]

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[157] Antoniou M, Habib MEM, Howard CV, et al. Teratogenic effects of glyphosate-based herbicides: Divergence of regulatory decisions from scientific evidence. J Env Anal Toxicol. 2012;S4:006. doi:10.4172/2161-0525.S4-006.
[158] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/
[159] European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk
[160] European Commission Health & Consumer Protection Directorate-General. Review report for the active substance glyphosate. 2002. Available at: http://bit.ly/HQnk
[161] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:205. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/
[162] Fagan J PhD, Antoniou M PhD, Robinson C MPhil. GMO Myths and Truths 2nd Edition. Earth Open Source. 2014:4.1:215. Available at: http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/

The above evidence demonstrates that glyphosate and glyphosate herbicide formulations are highly and chronically toxic to non-plant organisms and that there is high likelihood of adverse cumulative impacts resulting from repeated and aggregate exposure to herbicides. Therefore the Draft TPEIR's assertion that "the low toxicity of herbicides to humans and animals reduces the potential for significant cumulative impacts from the use of herbicides"[163] is false.

D. Conclusion

Contrary to the Draft TPEIR's conclusion, based on the above, significant cumulative adverse impacts related to herbicide use would remain **significant**. The Draft TPEIR fails to adequately disclose, analyze and mitigate potentially significant cumulative impacts related to herbicide use.

XV. THE DRAFT TPEIR FAILS TO ADEQUATELY DISCLOSE, ANALYZE, AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS RELATED TO PESTICIDE USE DUE TO THE MARIN COUNTY OPEN SPACE DISTRICT (MCOSD) OVERSEEING PEST MANAGEMENT FOR MARIN COUNTY OPEN SPACE DISTRICT LANDS WHILE NOT BEING SUBJECT TO THE MARIN COUNTY IPM ORDINANCE NO. 3521

The Marin County Parks coordinates the Integrated Pest Management (IPM) Program for the County. In 1983, Marin County developed an IPM Policy. The IPM policy and an associated IPM Ordinance (County Ordinance No. 3521) were subsequently adopted by the Marin County Board of Supervisors in 1998 and amended in 2013. The IPM policy governs and guides the control of invasive plants and pests on property owned, managed and leased by the County. The policy explicitly states it is "the purpose and intent of policy to ensure effective pest management... with the goal of eliminating the use of pesticides."[164] The County's IPM Ordinance No 3521 is used as a

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[163] Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015: Pg. 365

[164] County of Marin Integrated Pest Management Policy and Integrated Pest Management Ordinance No. 3521, adopted by the Board of Supervisors, July 21, 2009.

model to guide the MCOSD practices **BUT the MCOSD is not subject to the ordinance or the recommendations of the IPM Commission.** [165]

This could create significant impacts because the MCOSD is not required to follow the IPM ordinance adopted by public representatives. That allows the MCOSD staff to make decisions independent of public input and requirements, which can affect disclosure, analysis and use of hazardous substances that could potentially adversely impact human's and other species' health, habitats and resources, such as water, that constitute our open space environment.[166]

XV. CONCLUSION

7-18 The Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (TPEIR) cannot be relied on to approve the Project. The Marin County Open Space District must prepare a revised TPEIR that adequately analyzes the Project's potentially significant impacts – especially the true ones that have been avoided.

As it stands, the DRAFT TPEIR is a woefully inadequate CEQA document. The Draft TPEIR's conclusions are not supported by substantial evidence and current science. The Draft TPEIR fails to adequately disclose, analyze, and mitigate the Project's potentially significant impacts with respect to herbicides, both present and future ones, among others. The Draft TPEIR fails to demonstrate how the Marin County IPM Ordinance (No. 3521) goal of "eliminating the use of pesticides" in the County would be achieved.

The Marin County Open Space District should not and cannot approve the Project until an adequate TPEIR is prepared and circulated for public review and comment. Furthermore, substantive evidence shows that to protect the health and safety of non-target vegetation, aquatic organisms, invertebrates, animals and humans, glyphosate and glyphosate herbicide formulations should be banned from use in Marin County Open Space District lands.

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165 Nichols, Berman. Draft Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report. Marin County Open Space District. 2015:Pg. 162
166 Marin County. Marin County Environmental Impact Review Guidelines – Appendix N. Pg. 250, Pg. 251

7-19 Yours with sorrow at realizing the County has tried to circumvent public scrutiny,

Sandy Ross

Sandra Ross, Ph.D., President & CEO Health & Habitat, Inc.

415-383-6130

RESPONSE TO COMMENT LETTER 7 - SANDRA ROSS, PH.D., PRESIDENT AND CEO, HEALTH & HABITAT, INC., JULY 5, 2015

Note: This comment letter is essentially a repeat of comment letter 4 from Sharon Rushton, Ann Spake, Laura Chariton, Sustainable TamAlmonte, Watershed Alliance of Marin, July 6, 2015. Only Health and Habitat's additions e.g. underlined, bolded or commented sections are identified as new comments.

Response to Comment 7-1

Comment noted. As stated in this comment, this comment letter is essentially a repeat of comment letter 4 from Sharon Rushton, Ann Spake, Laura Chariton, Sustainable TamAlmonte, Watershed Alliance of Marin, July 6, 2015. See Responses to Comments 4-1 through 4-90 for responses to comments raised in comment letter 4.

Response to Comment 7-2

Please see **Master Response 2 – Use of Glyphosate** for a discussion on WHO's conclusions regarding glyphosate. Refer to **Master Response 5 – Herbicide Use** for a discussion on substantially similar products.

Response to Comment 7-3

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate and soil. The peer-reviewed scientific literature and government documents related to the registration and regulation of glyphosate do not indicate damage or injury to soil organisms. The use of glyphosate is not limited to the control of broom. The VBMP is a high level program document that envisions a tiered approach to CEQA. After approval of the plan, the MCOSD will develop site-specific treatment plans that will address issues such as treatment method and post-treatment revegetation. Additionally, because the MCOSD uses an IPM approach that includes careful site scouting, management of one species to the detriment of another, or management in a manner that would result in disproportionate presence of a particular species is avoided.

Response to Comment 7-4

See Response to Comment 4-12.

Response to Comment 7-5

Please see **Master Response 6 – Impact Evaluation** for a discussion on endocrine disruption.

Response to Comment 7-6

As noted in **Chapter 1.0 Introduction** this EIR has been prepared by Marin County in accordance with the California Environmental Quality Act (CEQA, Public Resources Code sections 21000-21178.1), the State CEQA Guidelines (California Code of Regulations, Title 14, sections 15000-15387), and the Marin County Environmental Impact Review guidelines.

Please see **Master Response 12 - Deferral of Analysis and Mitigation** in response to comments regarding deferring the analysis of impacts and adequacy of the mitigation measures.

Response to Comment 7-7

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and safety. Refer to **Master Response 5 – Herbicide Use** for a discussion of herbicide products use by the District.

Response to Comment 7-8

See Response to Comment 7-7.

Response to Comment 7-9

Please see **Master Response 5 – Herbicide Use** for a discussion on cut-stump applications. When compared to a broadcast application technique, the alternative approach of using a cut stump application technique results in significantly less material applied per acre. This is a result of the highly targeted nature of cut stump applications. Although a higher concentration of herbicide is used under a cut stump approach, the total amount applied per acre to achieve control is less because of the spot application technique results in an area of application that is measured in square inches. In contrast broadcast application techniques are done on areas measured in hundreds or thousands of square feet. Glyphosate binds tightly to soil and is not taken up by adjacent plants. Please refer to **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate, soil, and effects on non-target plants.

Response to Comment 7-10

Please see **Master Response 12 - Deferral of Analysis and Mitigation** in response to comments regarding deferring the analysis of impacts.

Response to Comment 7-11

Please see **Master Response 5 – Herbicide Use** for a discussion on substantially similar products.

Response to Comment 7-12

Please see **Master Response 5 – Herbicide Use** for a discussion on substantially similar products.

Response to Comment 7-13

Comment noted. Based on this comment the first sentence under the heading Herbicide Degradation on page 364 is revised as follows:

> Past herbicide use in unlikely to contribute significantly to adverse cumulative impact as herbicides <u>generally</u> degrade rapidly in the environment.

Also see Response to Comment 4-76 and 4-77.

Response to Comment 7-14

Please see **Master Response 2 – Use of Glyphosate** for a discussion on the environmental effects of glyphosate. Refer to **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for a discussion of cumulative impacts.

Response to Comment 7-15

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide regulation, registration, risk assessment, and safety. Refer to **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity.

Response to Comment 7-16

See Response to Comment 7-04.

Response to Comment 7-17

Please see **Master Response 6 – Impact Evaluation** for a discussion on endocrine disruption.

Response to Comment 7-18

The Draft TPEIR and its associated BMPs, mitigation measures, and response to public comments adequately addresses and mitigates potential impacts to a less-than-significant level. The TPEIR discloses the herbicides that the MCOSD uses and a screening level risk analysis was done on each herbicide using scientific data from recognized and reviewed sources regarding the environmental fate and toxicity of the herbicides. This data was combined with conservative assumptions regarding exposure to estimate potential risk. As needed, BMPs and/or mitigation measures were designed to address potential risk and reduce it to a less-than-significant level.

Response to Comment 7-19

Comment noted.

Comment Letter 8

19-8

Health & Habitat, Inc.

76 Lee Street
Mill Valley, CA 94941
415-383-6130, fax 415-381-9214

July 8, 2015

By Fax: 415-473-3795, 7/8/2015 9am

James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903-4157
(415) 473-3745 (Tel)
(415) 473-3795 (Fax)
JRaives@marincounty.org

Re: Public Comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

Health & Habitat (H & H) has already commented on these documents, essentially saying that they do not satisfactorily address the significant effects the project activities will have on Marin County and its people and creatures – especially when low dose reactions are considered.

This letter is an addendum to be added to the initial submission.

We have previously shared the information below with agencies working on the Northridge (Blithedale Ridge, Mill Valley):

NEVER USE ANY PESTICIDE/HERBICIDE ON HEADWATERS and CREEKS FLOWING SOUTH (toward Mill Valley) from BLITHEDALE RIDGE (NORTHRDGE), west of the water tank above Charles Dean road (Rider Property).

The creek above end of Lee Street is the "**type locality**" for a special flat-footed fly – people have come from overseas to see it. The original paper on this discovery was written by Dr. Paul Arnaud of California Academy of Sciences, herein incorporated by reference in this letter. It was named after Beryl Buck, whose original Buck Trust put up matching funds for the County to buy the Northridge for Open Space, some 30 years ago. When something is a "type locality", it means it was first described from there and its area must be kept intact for continuing study and future reference; this is critical as the same creature from another location may be slightly different.

Also, the 2nd creek west (but still above Lee Street (which first turn is actually in MCOSD Open Space) – locally called Turtle Creek) – has the endangered Pacific Giant Salamander, as referenced by Dr. Skip Lazell. This means this creek also must not have any pesticide/herbicide – or other disturbance. Other creeks in the area could have the creature, so should be exempted from chemical poisons such as well.

8-01 MCOSD's TPEIR is inadequate and deficient as it does not include these special species, for which herbicides/pesticides are especially harmful, particularly to the salamander. We request they be included and evaluated.

8-02 Furthermore, even if a dose does not outright kill a creature the first time, it more likely will the second time. Worse yet, endocrine disruptors like pesticides, cause damage that can destroy a population and a species over several generations. TPEIR is inadequate and deficient as it does not address endocrine disruptors and their impact. We request they be included and their impact evaluated, including all papers by Dr. Theo Colborn and TEDX (The Endocrone Disruption Exchange).

8-03 The DTPEIR relies on US Environmental Protection Agency figures for, among other things, toxicity. Attached you will find a letter from a former EPA employee (Evaggelos Vallianatos, Ph.D.) referencing his book

8-03 (cont.)

POISON SPRING: The Secret History of Pollution and the EPA (hereby incorporated by reference), that throws into question all EPA claims, statements, and references. H&H requests all EPA references in the TPEIR be evaluated in light of this stunning revelation.

8-04

Another place the DTPEIR is inadequate and deficient is that it does not mention the California Department of Health Services survey nor the County 2001 one which showed 16% of the people of the state and 17% of the county consider themselves allergic or sensitive to chemicals; 6.3% of the people of the state were doctor diagnosed with Multiple Chemical Sensitivities of Environmental Illness. We request that this condition be evaluated and incorporated.

8-05

We request that MCOSD withdraw this DTPEIR and create a new one for comment which accurately and adequately identifies all the impact risks of herbicide/pesticide use, and satisfactory mitigations for each, including action alternatives actually and truly capable of avoiding such impacts.

8-06

Last night, July 7, 2015, the board of the Marin Municipal Water District, which has not used pesticides on its lands for a decade, unanimously voted to direct district staff to incorporate proposed revisions to the draft Wildfire Protection and Habitat Improvement Plan (WPHIP) and associated EIR which removes the use of herbicides. Health & Habitat requests the Marin County Open Space District also remove the use of herbicides/pesticides from its Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report.

With great sincerity and determination,

Sandra Ross

Sandra Ross, Ph.D., President & CEO

May 3, 2015

I am pleased you are working to create a safe environment for children in schools, an environment that is free of poisonous pesticides.

I worked for the US Environmental Protection Agency for 25 years. Most of that time I spent in the Office of Pesticide Programs of EPA. I had plenty of time to observe the science and the workings of the industry and the government bureaucracy in the regulation of pesticides like roundup.

My experience taught me NOT to trust the government's regulation of pesticides. This is because the industry, working through Congress and the White House, exercises a corrupting influence on the EPA that regulates pesticides. The implication of this reality is that these chemicals should not be on the market. They are biocides designed to kill all forms of life, including human life.

Second, pesticides are more toxic than the can labels say they are. Why? Because the user / consumer sprays not a single pesticide or active ingredient but a mixture of pesticides, many of them known carcinogens and others untested chemicals.

Third, there is a lengthy tradition of fraud in the testing of pesticides.

I summarized my findings about pesticides and government regulation in my recent book, "Poison Spring: The Secret History of Pollution and the EPA" (Bloomsbury Press, 2014, paperback March 2015). I strongly recommend this book as it is the first book that documents how and why the industry captured the EPA, rending unreliable all government statements about the "safety" of pesticides. The book, however, empowers the reader with knowledge to ask questions and take steps for the protection of human health and the natural world.

In addition, there are several studies documenting the adverse ecological and adverse human health effects of pesticides, including glyphosate or roundup.

Rosemary Mason, a physician from the UK, wrote to EPA, January 22, 2015, saying this about glyphosate / roundup:

"[G]lyphosate poisons humans in the same way as it poisons plants. Pesticide scientists and plant scientists have based their assessment of herbicides on complete ignorance of human physiology. UK physicians have failed to question the accuracy of the assessors' knowledge.

"Humans and animals have exactly the same pathway as in plants; mammals can only absorb nutrition via the bacteria in their gut; the gut microbiome. **The gut microbiome is the collective genome of organisms inhabiting our body.** Glyphosate residues in food disrupt the pathway which involves 5-enolpyruvylshikimate-3-phosphate synthase. Beneficial bacteria are destroyed, causing inflammatory changes in the gut lining, destroying its absorptive capacity in humans and animals, chelating (extracting or grabbing) minerals, depleting micronutrients and interfering with multiple metabolic processes resulting in obesity, type 2 diabetes, autism, dementia, cancers, inflammatory bowel diseases (Ulcerative Colitis and Crohn's disease), celiac disease, hypercholesterolaemia and many other disorders associated with those on a Western diet.

"Glyphosate has been registered as a herbicide for 40 years under false premises." (Private communication.)

In other words, a legacy of fraud in the testing of pesticides and the overwhelming influence of the chemical and agribusiness industry over EPA and other global regulatory authorities, all but guarantees that pesticides are dangerous for both the natural world and human beings, especially children.

Fortunately, we have effective alternatives to the deleterious pesticides. Organic farmers raise food without pesticides. And concerned citizens refuse to use pesticides in schools, parks, lawns, and houses. Beyond Pesticides, an environmental organization in Washington, DC, has prepared a guide for alternatives to pesticides. This is easily accessible through the Internet.

With my best wishes,

Evaggelos Vallianatos, Ph.D.

Former EPA analyst; former professor; author of several books and hundreds of articles

Environmental Sensitivities, Chronic Fatigue Syndrome (CFS and Fibromyalgia

	% Yes	
	Overall	Males
Do you consider yourself allergic or sensitive to everyday chemicals like those found in household cleaning supplies, paints, air fresheners, perfumes, soaps, garden sprays, or products	17%	10%
Do you consider yourself sensitive to power lines or everyday electrical appliances such as televisions, microwaves, computers, cordless or cellular phones, or fluorescent lights?	7%	6%
In the past 12 months, have you been diagnosed with chronic fatigue syndrome or experienced fatigue and exhaustion that lasted more than 6 months?	5%	3%
In the past 12 months, have you been diagnosed with Fibromyalgia or had chronic muscle pain lasting more than 6 months?	4%	3%

Women, more than m
say they are affected b
these conditions.

Percent of people sensitive to chemicals - Recent surveys 7/20/00

NM Dept. of Heath[1] New Mexico	16% report being chemically sensitive 16% 2% are diagnosed MCS 2% lost a job or career because of chemical sensitivity
CA Dept of Health Services[2] CALIFORNIA	15.9% report "being allergic or unusually sensitive to everyday chemicals" 11.9% report "sensitivity to more than one type of chemical" 6.3% are doctor-diagnosed MCS or EI*
Rural population in eastern NC [3]	33% report chemical sensitivities North Carolina
Gulf War Registry[4]	36% report chemical sensitivity
Study of patients in NJ [5]	5.5% diagnosed MCS 9.3% score "positive for hypersensitivity" (includes MCS group)** [Data is incomplete]

RESPONSE TO COMMENT LETTER 8 - SANDRA ROSS, PH.D., PRESIDENT AND CEO, HEALTH & HABITAT, INC., JULY 8, 2015

Response to Comment 8-1

The commentor indicates that the "type locality" of the flat-footed fly (*Platypezidae*) and California giant salamander (*Dicamptodon ensatus*) (the Pacific giant salamander is not present in Marin County) are reported from Blithedale Summit (Northridge) preserve, and concerns that the Draft TPEIR is inadequate and deficient because it does not acknowledge these two species, or the potential harm from possible application of herbicides.

Pacific giant salamander has no State or federal listing, but according to the latest "Special Animals List" (dated April 2016) maintained by California Department of Fish and Wildlife (CDFW) it has a Global rank of G3 (Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations often 80 or fewer, recent and widespread declines, or other factor) and a State rank of S2S3 (S2 Imperiled – Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer); S3 Vulnerable – Vulnerable in the state due to a restricted range, relatively few populations, often 80 or fewer) according to the NatureServe ranking system, an established network of biological Inventories. In this ranking system, a combined State ranking (such as S2S3) means there is some uncertainty about the ranking and that the rank is somewhere between S2 and S3. But based on this Global and State ranking, this species would qualify as a special-status species warranting consideration under *State CEQA Guidelines* section 15380.

Flat-footed flies are in the family Platypezoidea and contain over 150 species. The comment referenced a "special flat-footed fly", but did not include the scientific name. There are no flat-footed flies listed under the California Department of Fish and Wildlife Special Animal list (July 2016), nor is there any species of flat-footed fly that is it managed or regulated by the US Fish and Wildlife Service.

A discussion of special-status species known or suspected to occur on the MCOSD preserves is provided on pages 115 through 119 of the Draft TPEIR. This includes a general definition of special status species, which states that species maintained on the CDFW lists of Special Animals and Special Plants that have an Element Ranking of 3 or less are considered a special-status species. Although both Pacific giant salamander and flat-footed fly would qualify under this definition of special-status species, neither species was included in the table of special-status species entitled "Potential for Special-status Plant and Wildlife Species to occur in the MCOSD Preserves" prepared as part of the Road and Trail Management Plan, contained in **Appendix B** of the Draft TPEIR. And neither species was included in **Table B.3 Special-Status and Other Species of Special Concern that Could Exist on Preserves** of the VBMP. As acknowledged on page 119 of the TPEIR, while the CNDDB records provide the most extensive data on the known distribution of special-status species in the state, they are not conclusive in verifying presence or absence in a particular location. The CNDDB occurrence records also tend to focus on listed species or those with a high inventory priority, and only provide data where previous surveys or encounters with special-status species have been observed and reported. Occurrence information for numerous special-status species that are known from or tend to frequent Marin County is either not monitored at all or is recorded on only a sporadic basis by the CNDDB. There remains varying potential for other special-status species to occur on MCOSD preserves, and more comprehensive lists should be considered as part of BMPs in advance of conducting systematic surveys before initiating habitat management activities associated with the VBMP.

The MCOSD is continuously updating information on special-status species known or suspected to occur on its preserves, and will update the VBMP to include this information on these two species. Future management activities in the Blithedale Summit and other preserves where these species may be present would consider potential implications on all special-status species known or suspected to occur on MCOSD preserves. The analysis of potential impacts on special-status species discussed under *Impact 5.1-1 Special-status Species* on pages 132 through 134 of the Draft TPEIR would still apply to these and other special-status species. This includes acknowledging the potential for direct loss of individuals or localized populations, elimination or degradation of essential habitat, and further isolation of subpopulations as a result of habitat loss and fragmentation. Chemical treatment, as a vegetation management practice, can sometimes be the most effective means to control and eradicate invasive species that otherwise threaten sensitive natural resources, but herbicides could adversely affect occurrences or individual special-status species when applied directly onto the resource, through drift if applied during high wind conditions, or onto receiving waters supporting aquatic dependent species. Water quality degradation as a result of herbicide application or secondary effects of erosion and sedimentation from grading and vegetation removal, trail development and closure, and other activities on MCOSD preserves could result in direct and indirect affects unless adequate controls are undertaken as part of management practices and facility improvements.

As discussed on page 134 of the Draft TPEIR, implementation of the relevant BMPs from the VBMP and conformance with relevant policies and programs from the Countywide Plan and VBMP would generally serve to avoid and minimize potential adverse impacts of vegetation management and other activities implemented under the VBMP. Relevant BMPs acknowledge the need to determine whether any special-status species are present in the vicinity of anticipated treatment activity areas, and to provide appropriate avoidance and protection measures. However, further refinement of a number of BMPs would be necessary to clarify specific treatments in the vicinity of special-status species and other sensitive natural resources, and that adequate mitigation is provided where disturbance to essential habitat of special-status species cannot be avoided. Several BMPs in the VBMP call for establishing a buffer of at least 100 feet around special-status species occurrences, or essential habitat features such as nests in active use. But the VBMP contains no details on how the MCOSD would implement exceptions to adherence of this 100-foot setback. This is necessary because other components of the VBMP would require activities within the buffer zone, especially where vegetation treatment may be necessary for invasive species control and eradication where they pose a substantial threat to the sensitive resource, or for essential fire fuel management activities.

The Draft TPEIR includes mitigation measures that would refine certain BMPs in the VBMP to further define management practices within the buffer areas around sensitive natural resources that would be necessary to ensure that no adverse secondary affects occur, including the potential to impact individual or occurrences of special-status species. Adoption of Mitigation Measure 5.1-1 in the Draft TPEIR, together with effective implementation of relevant BMPs and policies in the VBMP, and oversight by regulatory agencies entrusted with enforcement of state and federal regulations that address protection and management of special-status species, would reduce adverse effects on special-status species resulting from vegetation management activities of the MCOSD implemented as part of the VBMP to a less-than-significant level. The treatment program recommended in revisions to **BMP-Sensitive Natural Resources-1** would evaluate options for treatment and risk to sensitive natural resources, define a preferred treatment plan, identify controls for avoiding and minimizing potential adverse effect on the sensitive natural resource, provide details on any required compensatory mitigation, and would include requirements for monitoring. These controls would serve to ensure that necessary vegetation treatment, fire fuel management and other activities performed within the buffer area around sensitive natural resources would result in no additional significant impacts on biological resources, including special-status species.

In response to the comment, the table of “Potential for Special-status Plant and Wildlife Species to occur in the MCOSD Preserves” contained in **Appendix B** of the Draft TPEIR has been revised to include the additional information on California giant salamander, and to include relevant information in the “Key to status codes on page B-32 on the Element Ranking system as follows.

Species	Status	Habitat	Potential for Occurrence
California giant salamander (*Dicamptodon ensatus*)	G3 S2S3	Found in a variety of aquatic habitats on West Coast, including lakes, ponds, rivers, and streams. Prefers fast moving water to slow moving water. Cover is a vital characteristic, used for hiding, protection from sun, and brooding eggs.	Reported from Turtle Creek near Blithedale Summit. Suitable habitat in other preserves where perennial aquatic habitat is present.

CNDDB ELEMENT RANKING

Global Ranking:

The global rank (G-rank) is a reflection of the overall status of an element throughout its global range. Both Global and State ranks represent a letter and number score that reflects a combination of Rarity, Threat, and Trend factors, with weighting being heavier on Rarity than the other two.

G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 = Secure—Common; widespread and abundant.

State Ranking:

The state rank (S-rank) is assigned much the same way as the global rank, but state ranks refer to the imperilment status only within California’s state boundaries.

S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.

S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.

S4 = Apparently Secure—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors. S5 = Secure—Common, widespread, and abundant in the state.

Response to Comment 8-2

Please see **Master Response 6 – Impact Evaluation** for a discussion on endocrine disruption and cumulative impacts. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 8-3

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide regulations, registration, risk assessment, and safety.

Response to Comment 8-4

Please **Master Response 1 – Multiple Chemical Sensitivity** for a discussion on chemical sensitivity and allergies.

Response to Comment 8-5

Comment noted. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis.

Response to Comment 8-6

Comment noted. This comment is not about the adequacy of the Draft TPEIR, no further response is necessary.

Comment Letter 9

To: James Raives

From: MAPE Shop Steward Don Grafe

Date: July 8th, 2015

Re: Response to the TPEIR of the VBMP

Statement:

The Marin Association of Public Employees (Union) would like to express appreciation for the opportunity to provide feedback and comments to the draft Tiered Program Environmental Impact Report (Draft TPEIR) of the Vegetation and Bio-Diversity Management Plan (VBMP).

The comments and feedback contained herein arise from union and are expressed by Ranger Don Grafe, Shop Steward MAPE.

9-01 Paramount to the concerns is the compliance with State and Federal Regulatory Acts, specifically the Federal Migratory Bird Act, and the Endangered Species Acts by Union members of MAPE while conducting county business.

Background:

On 02-06-2013 managers of the Parks Department sent an e-mail informing field staff responsible for conducting annual fuel-reduction mowing operations that they could no longer cut fuels (i.e., grass and shrubs) in or around marsh habitat regardless if there may or may not be an animal there. The animal of concern is an endangered species The California Clapper Rail. Several Preserves are listed as restricted from fuel-reduction work during the time period of February 1 – August 1. The preserves are:

- Santa Venetia Preserve
- Santa Margarita Island Preserve
- Deer Island Preserve
- Areas of Ring Mountain Preserve
- Rush Creek Preserve
- Bothin Marsh Preserve
- Starwberry Shoreline
- Bolinas Lagoon
- Mill Valley-Sausalito Bike Path

There is no other communicated species of special concern, either plant or animal, considered as requiring avoidance other than the California Clapper Rail.

On 05-26-2015 an email from the department to the California Dept. Fish and Wildlife seeks an exemption permit for a bridge construction project at Roy's Redwood Preserve. The Parks Dept. Senior Planner then informs Grafe that pre-construction mowing can begin. Grafe then reports mowing over holes which appear to be made by the American Badger, a California Species of Special concern.

On 06-08-2015 a Parks superintendent reports a problem with broom encroaching onto the tread of the Elinor Fire Road. The union steward requests that pre-construction signage be placed at the entries to inform the public of the project and requests to know if there are any special species of plant within the construction zone. Again the Senior Planner is referred to as

providing second-hand authorization to the Superintendent to begin work. The union steward then asks again about checking the Badger holes at Roy's Redwood because he has been instructed to return and perform additional mowing. The Senior Planner then asks if the operator is he is aware of Badger avoidance measures.

Again on 06-08-2015, in an email, the Superintendent discusses with the operator the specifics of the pre-construction vegetation removal on Glen and Elinor Fire Roads within the Blithedale Summit Preserve.

On 06-15-2015, in an email, the operator expresses concerns regarding compliance with the Federal Migratory Bird Act and the Endangered Species Acts. He asks for more information regarding surveying at Roys for Badgers and the clearance of 150' from centerline of both Elinor and Glen Fire Roads for ground nesting birds. The Resource Specialist states that birds were not surveyed for on Glen Fire Road due to broom patches. He is familiar with the badger holes at Roy's, and they look old, no need to worry about them unless there is evidence of fresh activity. The Union Steward requests for a meeting in regards to the surveys and compliance with regulatory acts.

On 06-19-2015, in an email, Bio-monitors report not seeing any new badger activity within the additional mow zone. They clear the Santa Venetia Marsh for annual fuel-reduction work.

On 06-23-2015 the Union has a meeting with the Parks Department as requested on 06-15-2015 to discuss survey procedures. The meeting occurs at 3:00p – 3:30p in room 260 of the Civic Center. (NOTES ATTACHED, Item 1)

Again on 06-23-2015, in an email following the survey meeting the Parks Department communicates with the steward/operator mitigation measures and data collection. The steward receives a revised draft protocol for nest surveys. The draft protocols are the 3rd revised draft protocol. Annual fuel-reduction mowing had already been completed for the year for interior location within preserves when this protocol was delivered.

Feedback:

Although the VBMP is in its draft form, the Road and Trail Management Plan (RTMP) was adopted by the Board of Supervisors on December 16, 2014.

The RTMP has several components related to compliance with regulatory acts in regards to pre-construction operations. They are closely related components to the VBMP:

1. Pre-Construction Ligature, 6-8

   "MCOSD staff or a representative will conduct a literature review to determine if any special-status species and habitats have the potential to occur in the construction project area" and "..the natural resource database contains the most relevant data on sensitive resources"

2. Pre-Construction Surveys, 6-9

   "If sensitive resources are located, the appropriate resource agencies will be contacted and the necessary permits acquired".

3. Construction Timing Windows, 6-10

   "If nesting birds are present in the project areas, construction will take place outside of the breeding season or after the young have fledged; or appropriate buffers will be established consistent with state and federal law."

4. Worker Awareness Training and Construction Tailgate Meetings, 6-11

   "A qualified biologist will conduct worker awareness training prior to any construction activities in areas with federal and state-protected sensitive resources. Training will educate workers about resource identification, avoidance measures, and necessary action if a sensitive resource is encountered".

5. Table 6.3 Special-Status Wildlife Best Management Practices, Wildlife – 3

   "Identify potential habitat for nesting birds and survey to determine if active nests are present before initiating road and trail management actions. Surveys will include the proposed road and trail management footprint, and a ¼ mile buffer area (for raptors) or a 150 foot buffer area (for other birds). If impacts to nesting birds cannot be avoided, contact the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife to obtain the necessary permits before initiating road and trail management activities".

9-02

The union is concerned about the Parks management non-adherence to its own adopted procedures for protecting all special status species of plant and animal in regards to directing its member's assigned duties related to pre-construction activities.

Although the Parks Department is aware of other locations that the American Badger is found within preserves, according to the TPEIR the only location "documented" for the American Badger is 0.6 miles west of Bolinas Lagoon (Appendix C-7). Parks staff has encountered the American Badger during the construction of the 680 Trail connecting Sleepy Hollow Preserve with Loma Alta Preserve. A burrowing badger was protected by staff on the Deer Camp Fire Road within the Mt. Burdell Preserve, and a burrowing badger was protected on 06/2015 within the Lucas Valley Preserve by resource staff.

9-02 (cont.)

Burrows of the American Badger were photographed in close proximity to the pre-construction area of the Roy's Redwood preserve by the shop steward for MAPE on 06-23-2015 (Item 2). During the discussion with the Parks department on 06-23-15 regarding its surveying, the Department disclosed that not all the range distribution maps for protected species were current as presented in the TPEIR (see figure 6-12 Special-status Wildlife Species within 3 miles of Region 6 Preserves). The presence of the American Badger at Roy's Redwood Preserve seem to have been ignored by staff prior to directing staff to conduct pre-construction activities.

An attached map delivered to the union indicates the presence of the American Badger throughout Marin, with related vegetation types indicating the probability of occurance. (Item 3).

In regards to pre-construction activities on Blithedale Summit, no bird surveys were conducted, and the rational was that broom patches extended 150 feet in both direction from the centerline of the fire roads. This is not accurate. The Glen Fire and Elinor Fire Roads have small patches of broom along the shoulders of the roads, and just outside of broom patches are native vegetation of oak, madrone, bay laurel, manzanita, chamise and other herbaceous annuals. Yet no surveys were conducted to comply with the Federal Migratory Bird Act, and the union is unaware that nessecary permits were obtained.

Concerns:

9-03

Within all emails and discussions regarding fuel reduction work and in conjunction with the language of the RTMP and the Draft VMP there is no clear evidence that prior to fuel-reduction work, not only will the department survey for nesting birds, but also for plants and animals of special concern. The Union asks that the department fully commit to adherence of these protocols to ensure MAPE member are in compliance with Regulatory Acts.

Staff conducting fuel reduction/modification activities have not to this date been instructed on how to identify special status species (plant or animal), nor have they informed of their locations within these work zones. The Union asks that the department begin to educate and conduct trainings for all staff on the identification of special status species (see figure 6-1 through 6-13 of the VBMP) within future assigned work zones and instruct staff accordingly as to avoidance measures.

The union asks that the intra-department Draft protocol for nesting bird surveys (aside from including a search for all special status species) be formalized and presented to the public as a matter of transparency.

The Union requests that maps of the distribution of special status species be updated to reflect current scientific data (refer to figures 6-1 through 6-13, and Appendix C of the VBMP).

Thank you for considering this feedback and concerns,

For MAPE – Ranger Don Grafe

Referenced e-mails:

April 20, 2015 (Fwd of email sent 02-06-13)., From: Sanford To: Acosta, et al. Subject: New Mowing Standards.

Includes email strand from 02-06-2013 @ 3:14pm; 12:34pm, and 6:56am.

May 26, 2015. From: Grafe To: Sagues, Martin. Subject: Roy's Redwood Non-Nesting

Includes email strands dated May 19 @11:32 am, May 6th @10:57 am, May 5 @ 9:53am, May 4th @ 3:23pm.

June 8, 2015. From: Grafe To: Sagues. Subject: Elinor FR Broom.

Includes email strand from June 8th, @ 9:15am, @ 7:39am, @ 7:36am.

June 8, 2015. From: Grafe To: Sagues. Subject: Veg Removal NRS.

Includes email strand from June 8th @1:49pm, @11:14am.

June 15, 2015. From: Grafe To: Abercrombie. Subject: RE: Checking in About Bird Surveys

Includes email strand from June 15 @ 10:18am, @ 9:41am, @ 9:29am, @ 8:54am.

June 19, 2015. From: Abercrombie To: Grafe Subject: Pre-mowing bird surveys progress as of 6/19.

June 23, 2015. From: Abercrombie To: Martin. Subject: RE: Bird Survey Nesting Protocols, **Attachment included.

Item 1

A. <u>Notes from request by MAPE (union) to meet with Parks Department (County) regarding compliance with the Federal Migratory Bird Act, and compliance with the Endangered Species Acts (State of CA and Federal Gov't) during annual fuel reduction operations and project site clearings.</u>

B. <u>Date: Tuesday, June 23rd 2015, 300p-330p, Civic Center Rm. 260</u>

<u>Present: Union: Grafe, County: Sanford, Martin, Abercrombie</u>

C. Union: What are the Parks surveying protocols for disturbance prior to mowing?

County: We are still in the process of completing. Protocols still in draft form.

Union: Are the protocols for the surveying communicated to the public in the Vegetation and Bio-Diversity Management Plan?

County: The protocols are not for public disclosure.

Union: Why are surveys for birds not also accompanied by information regarding endangered species as well as inspectionsfor rare and threatened plant species?

County: Lack of staffing at this point. We are working on it.

Union: Why was the vegetation clearance and tree pruning on Glen Fire Road (Blithedale Summit) approved with a bird survey?

County: It was a judgment call by the Natural Resources Division.

Union: Was the assignment to also cut vegetation on the Elinor Fire Road (Blithedale Summit) approved without checking it for birds?

County: Possibly.

Union: Was the Roy's Redwood Preserve cleared for non-disturbance to the American Badger prior to authorization for it to be mowed for the bridge installation project?

County: There are constraints to the Natural Resource Division.

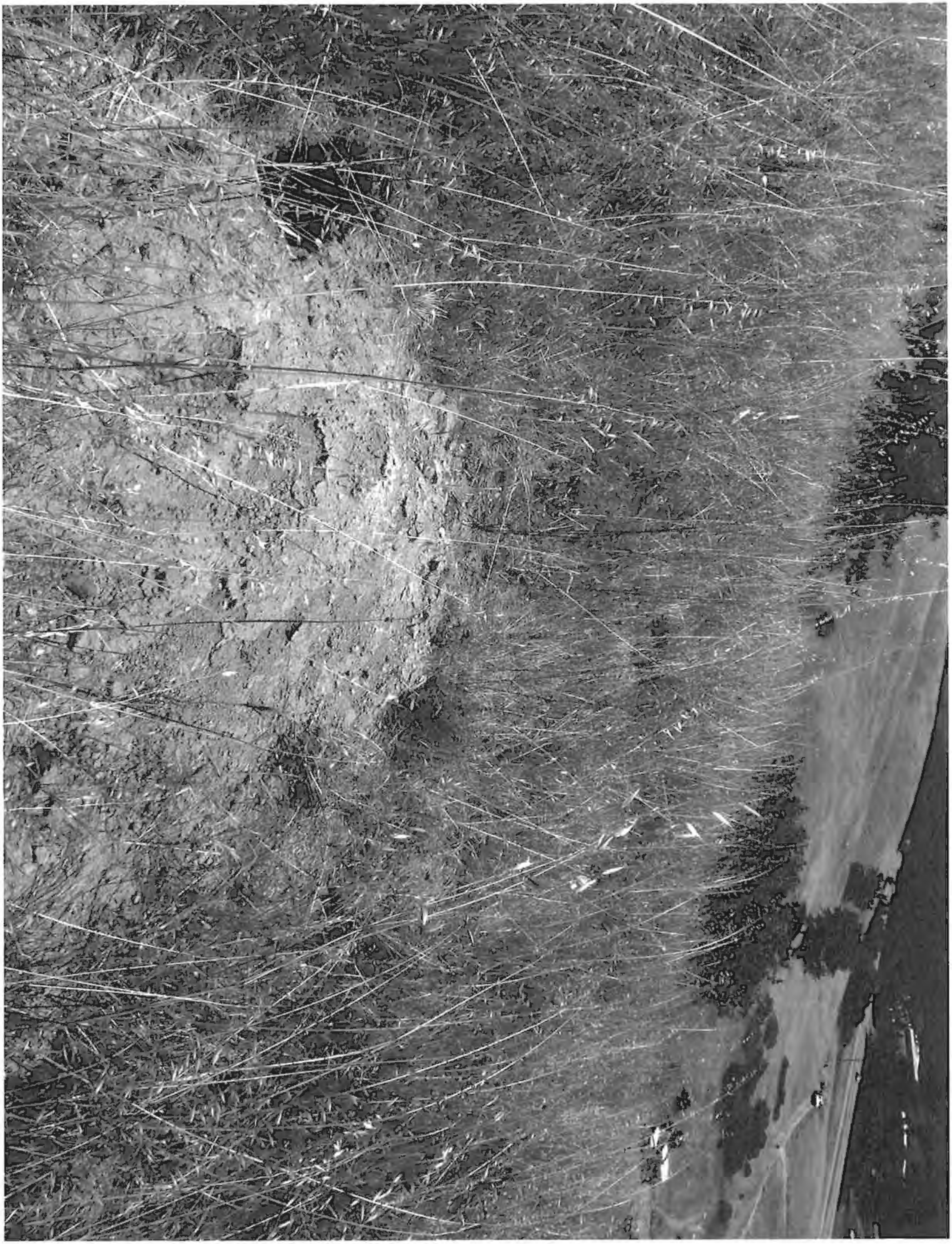
Union: Badgers were avoided during the construction of the 680 trail. A Badgers was protected while it burrowed on Mt. Burdell, and a badger is actively being protected on the Big Rock Preserve. Why does the distribution maps within the TPEIR of (VMP) only show the occurrence of the American Badger in the Bolinas Lagoon area and not these other known sites?

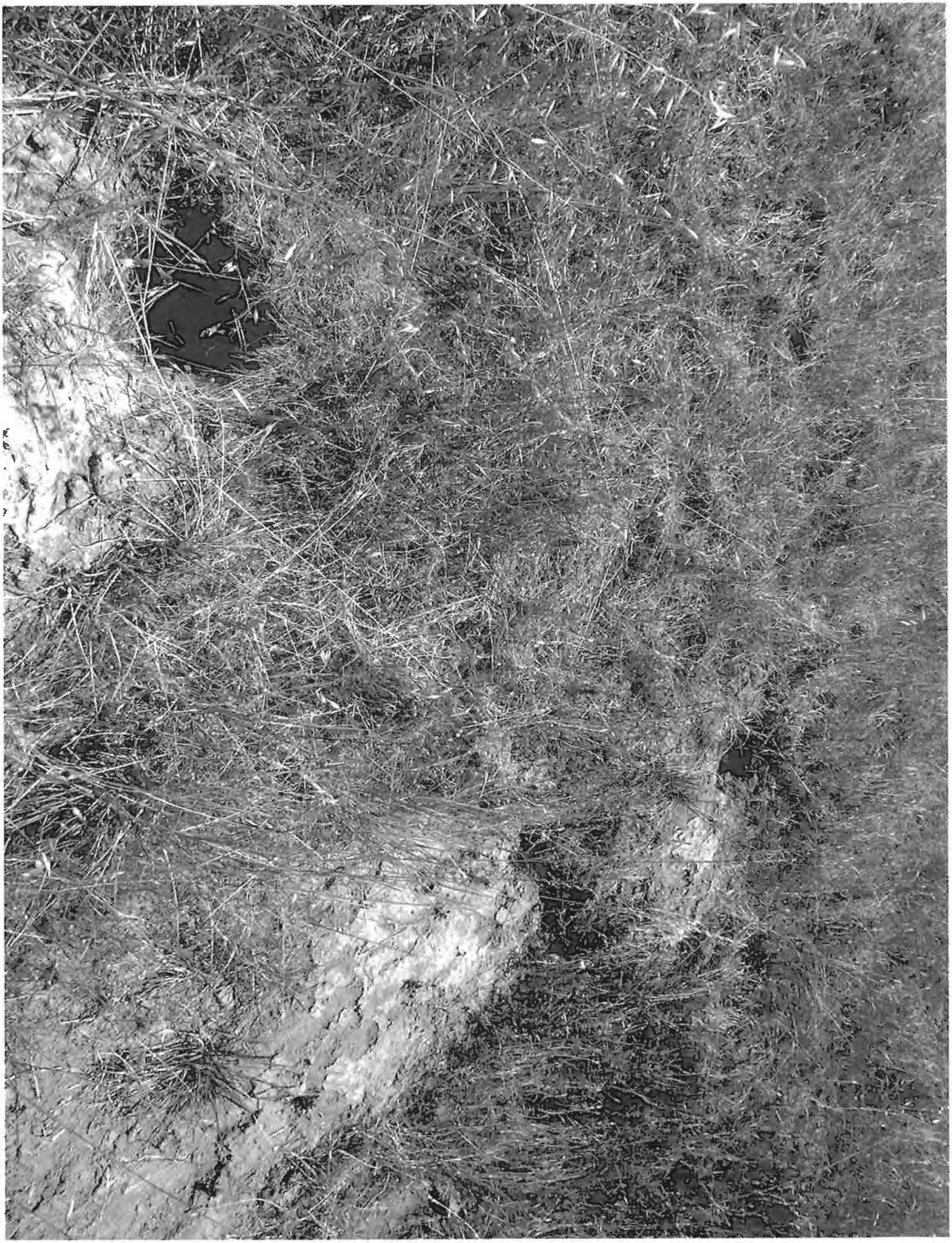
County: The county paid a consultant for those maps. They come from the CNDB database. They may not be current, but the county is working on additional surveying.

Union: Does CEQA require a detailed analysis of impacts on Special Status Species before beginning a project?

County: Yes.

Item 2





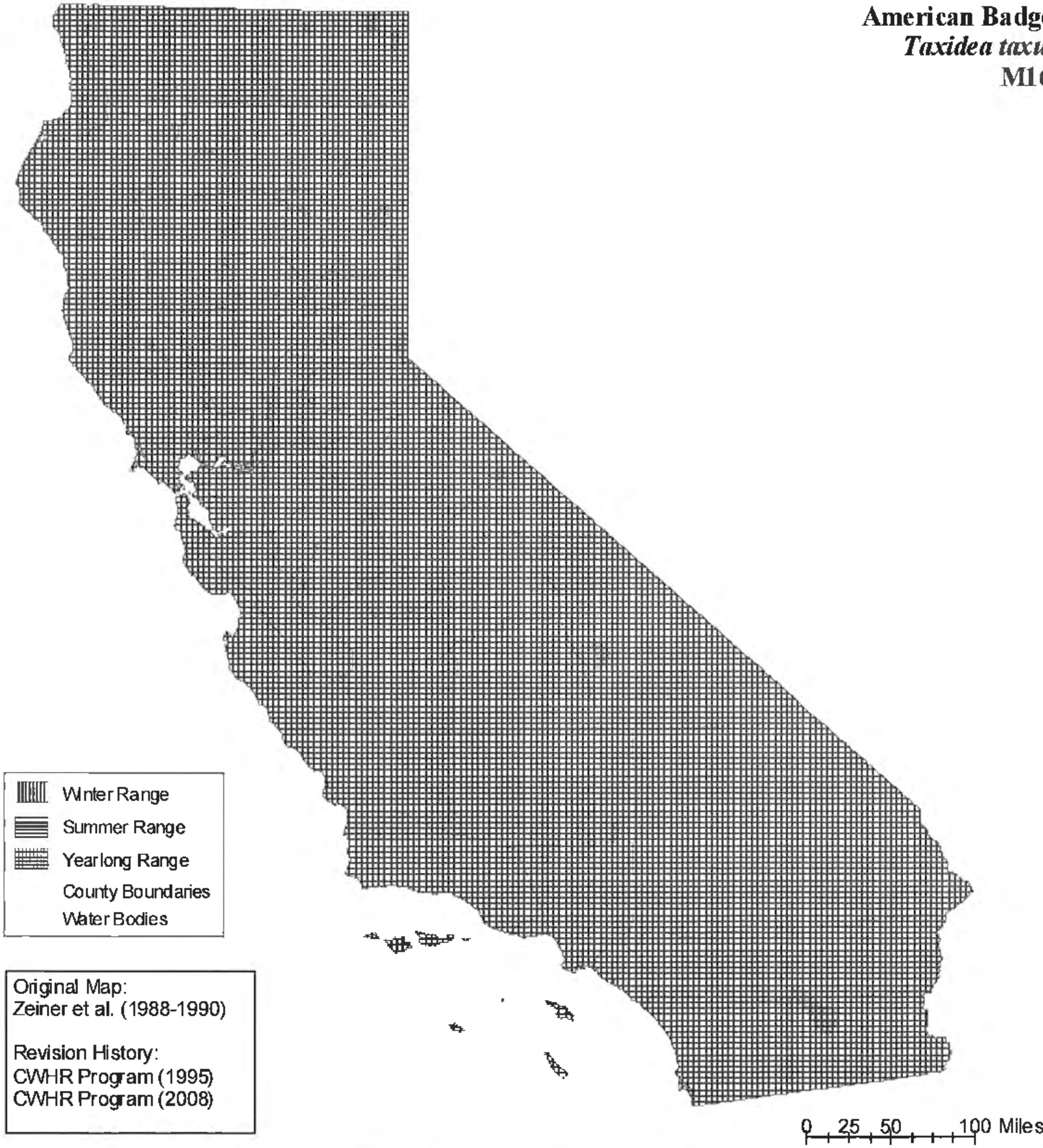
Item 3

California Wildlife Habitat Relationships System

California Department of Fish and Wildlife

California Interagency Wildlife Task Group

American Badger
Taxidea taxus
M160



Range maps are based on available occurrence data and professional knowledge. They represent current, but not historic or potential, range. Unless otherwise noted above, maps were originally published in Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California. Updates are noted in maps that have been added or edited since original publication.

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS SYSTEM
supported by the
CALIFORNIA INTERAGENCY WILDLIFE TASK GROUP
and maintained by the
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
Database Version: 9.0

SPECIES DETAILED REPORT

FE = Federal Endangered CF = California Fully Protected PT = Federally-Proposed Threatened CD = CDF Sensitive
FT = Federal Threatened CP = California Protected FC = Federal Candidate HA = Harvest
CE = California Endangered SC = California Species of Special Concern BL = BLM Sensitive
CT = California Threatened PE = Federally-Proposed Endangered FS = USFS Sensitive
Note: Any given status code for a species may apply to the full species or to only one or more subspecies or distinct population segments.

ID	Species Name	Status		Native/Introduced
M160	AMERICAN BADGER	SC	HA	NATIVE

Location Name	Season
Marin	Yearlong

Habitat Name	Season	R	C	F
Annual Grassland 1S	Yearlong	H	H	H
Annual Grassland 1P	Yearlong	H	H	H
Annual Grassland 1M	Yearlong	H	H	H
Annual Grassland 1D	Yearlong	H	H	H
Annual Grassland 2S	Yearlong	H	H	H
Annual Grassland 2P	Yearlong	H	H	H
Annual Grassland 2M	Yearlong	H	H	H
Annual Grassland 2D	Yearlong	H	H	H
Barren 1	Yearlong	M	M	M
Blue Oak Woodland 1	Yearlong	H	H	H
Blue Oak Woodland 2S	Yearlong	M	M	M
Blue Oak Woodland 2P	Yearlong	L	L	L
Blue Oak Woodland 3S	Yearlong	L	L	L
Blue Oak Woodland 3P	Yearlong	L	L	L
Blue Oak Woodland 4S	Yearlong	L	L	L
Chamise-redshank Chaparral 1	Yearlong	H	H	H
Chamise-redshank Chaparral 2S	Yearlong	M	M	M
Chamise-redshank Chaparral 2P	Yearlong	L	L	L
Chamise-redshank Chaparral 2M	Yearlong	L	L	L
Chamise-redshank Chaparral 3S	Yearlong	M	M	M
Chamise-redshank Chaparral 3P	Yearlong	L	L	L
Chamise-redshank Chaparral 3M	Yearlong	L	L	L
Chamise-redshank Chaparral 4S	Yearlong	M	M	M
Chamise-redshank Chaparral 4P	Yearlong	L	L	L
Chamise-redshank Chaparral 4M	Yearlong	L	L	L
Closed-cone Pine-cypress 1	Yearlong	L	L	L
Closed-cone Pine-cypress 2S	Yearlong	L	L	L
Closed-cone Pine-cypress 3S	Yearlong	L	L	L
Coastal Oak Woodland 1	Yearlong	H	H	H
Coastal Oak Woodland 2S	Yearlong	M	M	M
Coastal Oak Woodland 2P	Yearlong	L	L	L
Coastal Oak Woodland 3S	Yearlong	L	L	L
Coastal Oak Woodland 3P	Yearlong	L	L	L
Coastal Oak Woodland 4S	Yearlong	L	L	L
Coastal Scrub 1	Yearlong	M	M	M
Coastal Scrub 2S	Yearlong	M	M	M
Coastal Scrub 2P	Yearlong	L	L	L
Coastal Scrub 3S	Yearlong	M	M	M
Coastal Scrub 3P	Yearlong	L	L	L
Coastal Scrub 4S	Yearlong	M	M	M
Coastal Scrub 4P	Yearlong	L	L	L

ID	Species	Status				Native/Introduced
	Deciduous Orchard 1	Yearlong	L	L	M	
	Douglas-fir 1	Yearlong	L	L	L	
	Douglas-fir 2S	Yearlong	L	L	L	
	Douglas-fir 3S	Yearlong	L	L	L	
	Eucalyptus 1	Yearlong	M	M	M	
	Eucalyptus 2S	Yearlong	M	M	M	
	Eucalyptus 2P	Yearlong	M	M	M	
	Eucalyptus 3S	Yearlong	L	L	M	
	Eucalyptus 3P	Yearlong	L	L	M	
	Eucalyptus 4S	Yearlong	L	L	M	
	Eucalyptus 4P	Yearlong	L	L	M	
	Eucalyptus 5S	Yearlong	L	L	M	
	Eucalyptus 5P	Yearlong	L	L	M	
	Irrigated Hayfield 1	Yearlong	L	L	M	
	Irrigated Row And Field Crops 1	Yearlong	L	L	M	
	Mixed Chaparral 1	Yearlong	H	H	H	
	Mixed Chaparral 2S	Yearlong	H	H	H	
	Mixed Chaparral 2P	Yearlong	M	M	M	
	Mixed Chaparral 2M	Yearlong	L	L	L	
	Mixed Chaparral 3S	Yearlong	M	M	M	
	Mixed Chaparral 3P	Yearlong	M	M	M	
	Mixed Chaparral 3M	Yearlong	L	L	L	
	Mixed Chaparral 4S	Yearlong	M	M	M	
	Mixed Chaparral 4P	Yearlong	M	M	M	
	Mixed Chaparral 4M	Yearlong	L	L	L	
	Montane Hardwood 1	Yearlong	H	H	H	
	Montane Hardwood 2S	Yearlong	M	M	M	
	Montane Hardwood 2P	Yearlong	L	L	L	
	Montane Hardwood 3S	Yearlong	L	L	L	
	Montane Hardwood 3P	Yearlong	L	L	L	
	Montane Hardwood-conifer 1	Yearlong	H	H	H	
	Montane Hardwood-conifer 2S	Yearlong	M	M	M	
	Montane Hardwood-conifer 2P	Yearlong	L	L	L	
	Montane Hardwood-conifer 2M	Yearlong	L	L	L	
	Montane Hardwood-conifer 3S	Yearlong	M	M	M	
	Montane Hardwood-conifer 3P	Yearlong	L	L	L	
	Montane Hardwood-conifer 4S	Yearlong	L	L	L	
	Montane Hardwood-conifer 4P	Yearlong	L	L	L	
	Montane Hardwood-conifer 5S	Yearlong	L	L	L	
	Montane Riparian 1	Yearlong	L	L	L	
	Montane Riparian 2S	Yearlong	L	L	L	
	Montane Riparian 3S	Yearlong	L	L	L	
	Montane Riparian 4S	Yearlong	L	L	L	
	Pasture 1	Yearlong	M	M	M	
	Perennial Grassland 1S	Yearlong	H	H	H	
	Perennial Grassland 1P	Yearlong	H	H	H	
	Perennial Grassland 1M	Yearlong	H	H	H	
	Perennial Grassland 1D	Yearlong	H	H	H	
	Perennial Grassland 2S	Yearlong	H	H	H	
	Perennial Grassland 2P	Yearlong	H	H	H	
	Perennial Grassland 2M	Yearlong	H	H	H	
	Perennial Grassland 2D	Yearlong	H	H	H	
	Redwood 1	Yearlong	L	L	L	
	Redwood 2S	Yearlong	L	L	L	
	Redwood 3S	Yearlong	L	L	L	
	Valley Foothill Riparian 1	Yearlong	L	L	L	
	Valley Foothill Riparian 2S	Yearlong	L	L	L	
	Valley Foothill Riparian 3S	Yearlong	L	L	L	
	Valley Foothill Riparian 4S	Yearlong	L	L	L	
	Valley Oak Woodland 1	Yearlong	H	H	H	
	Valley Oak Woodland 2S	Yearlong	M	M	M	
	Valley Oak Woodland 2P	Yearlong	L	L	L	
	Valley Oak Woodland 3S	Yearlong	L	L	L	

ID	Species	Status				Native/Introduced
	Valley Oak Woodland 3P	Yearlong	L	L	L	
	Valley Oak Woodland 4S	Yearlong	L	L	L	
	Vineyard 1	Yearlong	L	L	M	

Total Number of Species: 1

Query Parameters

Included Locations
Marin Co

Included Location Seasons
All Location Seasons Included

Included Habitats & (Stages)
Alkali Desert Scrub, Alpine Dwarf-shrub, Annual Grassland, Aspen, Barren, Bitterbrush, Blue Oak Woodland, Blue Oak-foothill Pine, Chamise-redshank Chaparral, Closed-cone Pine-cypress, Coastal Oak Woodland, Coastal Scrub, Deciduous Orchard, Desert Riparian, Desert Scrub, Desert Succulent Shrub, Desert Wash, Douglas-fir, Dryland Grain Crops, Eastside Pine, Estuarine, Eucalyptus, Evergreen Orchard, Fresh Emergent Wetland, Irrigated Grain Crops, Irrigated Hayfield, Irrigated Row And Field Crops, Jeffrey Pine, Joshua Tree, Juniper, Klamath Mixed Conifer, Lacustrine, Lodgepole Pine, Low Sage, Marine, Mixed Chaparral, Montane Chaparral, Montane Hardwood, Montane Hardwood-conifer, Montane Riparian, Palm Oasis, Pasture, Perennial Grassland, Pinyon-juniper, Ponderosa Pine, Red Fir, Redwood, Rice, Riverine, Sagebrush, Saline Emergent Wetland, Sierran Mixed Conifer, Subalpine Conifer, Urban, Valley Foothill Riparian, Valley Oak Woodland, Vineyard, Wet Meadow, White Fir

Habitat Suitability Threshold
Reproduction - Low, Cover - Low, Feeding - Low

Included Habitat Seasons
All Habitat Seasons Included

Excluded Elements
No Elements Excluded

Included Species
American Badger

Included Special Statuses
All Statuses Included

RESPONSE TO COMMENT LETTER 9 - DON GRAFE, MARIN ASSOCIATION OF PUBLIC EMPLOYEES, JULY 8, 2015

Response to Comment 9-1

The commentor is correct that the MCOSD must comply with all relevant state and federal regulations, including the Migratory Bird Treaty Act, Endangered Species Acts, and State Fish and Game code. A discussion of the state, federal and local regulatory framework pertaining to the protection and management of sensitive biological resources is provided under the Regulatory Context subsection in **Section 5.1 Biological Resources** on pages 120 through 126 of the Draft TPEIR. Coordination among MCOSD staff is critical to ensuring compliance with the relevant regulations pertaining to the protection and management of special-status species and other sensitive resources, as well as the visiting public and other agencies. As discussed on page 131 of the Draft TPEIR, the VBMP provides BMPs that address the protection and management of sensitive natural resources and biological diversity in general, control of invasive plants, fire fuel management and risk reduction, and on-going maintenance. These include BMPs similar or identical to those referenced by the commentor in the comment letter from the *Road and Trail Management Plan* by the MCOSD.

Response to Comment 9-2

The concerns of the commentor over the importance of internal coordination with MCOSD staff is noted. Information regarding occurrences of special-status species, such as sightings and potential dens of American badger, is changing constantly given the dynamic nature of natural systems, which reinforces the importance of monitoring and updating data, establishing effective methods to disseminate the latest information, and training workers where known or potential sensitive natural resources may be present. The information on special-status species summaries in the Draft TPEIR and VBMP is based on data reported by the California Natural Diversity Data Base and other information sources, and does not mean other occurrences of special-status species could not be present in other locations where suitable habitat is present, as acknowledged on page 119 of the Draft TPEIR. As acknowledged on page 119 of the Draft TPEIR, there remains varying potential for other special-status species to occur on MCOSD preserves, and more comprehensive lists should be considered as part of BMPs in advance of conducting systematic surveys before initiating habitat management activities.

The VMBP includes BMPs related to conducting necessary preconstruction surveys to confirm presence or absence of sensitive natural resources, including **BMP-Sensitive Natural Resources-1**, **BMP-Special-Status Wildlife Species-1**, **BMP-Special-Status Wildlife Species-2**, **BMP-Special-Status Wildlife Species-3**, **BMP-Special-Status Plants-1**, and **BMP-Fuel Management-6**, among others. As well as BMPs related to worker training in advance of implementing management activities, including **BMP-General-7-Include Standard Procedures in Construction Contracts, BMP-General-9-Conduct Worker Training**, and **BMP-Special-Status Plants-1**, among others. Also please see Response to Comment 9-2.

Response to Comment 9-3

The commentor questions procedures used by District in directing staff to perform various maintenance tasks, which they claim may be in violation of MBTA and inconsistent with BMPs from VBMP. There are internal procedures for vegetation maintenance utilized by the MCOSD. Until recently, operations staff conducted vegetation maintenance on an as needed basis. About three or four years ago, resources staff of MCOSD implemented requirements for consideration of nesting birds and other special-status wildlife and these new practices are now procedural requirements captured in the BMPs of the VBMP. Also, please see Response to Comment 9-1.

Friends of Corte Madera Creek Watershed
P.O. Box 415 • Larkspur • California 94977
info@friendsofcortemaderacreek.org (415) 456-5052 www.friendsofcortemaderacreek.org

July 8, 2015

Comment Letter 10

James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael CA 94903-4157

Dear Mr. Raives,

Friends of Corte Madera Creek Watershed has reviewed the Draft Programmatic EIR for the Vegetation and Biodiversity Management Plan. This is a huge undertaking and we congratulate you on reaching this milestone. Overall, it is an admirable plan with a comprehensive set of Best Management Practices. However, we are concerned that most of these measures will not be implemented for lack of adequate resources.

Here are our comments on the VBMP PDEIR:

10-01

Update name: California clapper rail (*Rallus longirostris obsoletus)* has been renamed Ridgway's rail (*Rallus obsoletus)*

10-02

Invasive cordgrasses: References to invasive cordgrass include only *Spartina alterniflora*. This may be the only species currently found in Open Space Preserves, but there are other invasive cordgrasses in Marin County: *S. densiflora* and hybrids of all the invasive species with the native cordgrass, *S. foliosa*. The Invasive Spartina Project is currently funded to work on eradication of these species and their hybrids from San Francisco Bay. However, if funding for that effort is discontinued before eradication occurs, Marin County may be required by the Agricultural Commissioner to continue the effort on its land. Furthermore, hybrids between the native cordgrass, *S. foliosa* and invasive cordgrasses can be difficult to identify and it may be necessary to use DNA analysis to make the distinction.

10-03

IPM and Herbicide Use: It is crucial for the protection of biodiversity and effective fire hazard management that the Open Space District maintain a complete tool kit for control of invasive plants. Clearly, herbicide use should be limited and used only when other methods are not adequate to control infestations, but we know from experience that mechanical and cultural methods will not be successful in controlling all invasives in every situation.

The DPEIR correctly acknowledges that the BMP that limits the use of herbicides in the 100-foot buffer around sensitive resources can conflict with the need to protect sensitive resources from the effects of the invasive plants that are the targets of the herbicide application. We support the implementation of Mitigation Measure 5.1-1 that accounts for this conflict.

10-04 Regarding application of herbicides, a new BMP under Mitigation Measure 5.2-1(b) could be included:

> **BMP Hydrology and Water Quality** Apply herbicides in tidal areas on a receding tide to maximize drying time.

10-05 The discussion of Habitat (page 248), active ingredient imazapyr, does not acknowledge that the primary form of degradation in water is photodegradation with a half-life of approximately 2 days. This makes it particularly suitable for use near aquatic environments.

10-06 **Standard 100-foot Setback from Sensitive Resources:** This refers to the standard 100-foot buffer around sensitive resources. Is 100 feet adequate to protect rail nests? The USFWS standard has been to maintain a 700-foot buffer around an occupied nest. Raptor nests are often protected by a much larger distance. This measure should recognize the need for buffers of varying size, depending on the sensitive resource.

10-07 **Wildlife Habitat and Movement Opportunities:** The measures identified in the discussion of Impact 5.1-4 Wildlife Habitat and Movement Opportunities do not reference the need to limit trails and off-trail use as they relate to the introduction of invasive organisms, the degradation of habitat, and impacts, including mortality, to wildlife.

10-08 **Erosion and Sedimentation:** The PDEIR does not acknowledge that preserves may have unstable upland areas that supply significant sediment, even in the absence of management activities that would create opportunities for erosion and subsequent sedimentation. For example, slopes prone to landslides are common in the Loma Alta and Terra Linda Divide preserves, which are known sources of excessive sediments into the Corte Madera Creek system. We recommend that the OSD address these areas, either through the Road and Trails Management Plan or through restoration projects undertaken to manage vegetation and biodiversity.

10-09 **Alternatives:** The PDEIR should add an alternative addressing the fate of vegetation and biodiversity if no herbicides were allowed on the preserves. This would be a valuable piece of information for the Directors of the Open Space District as respond to activists requesting a ban on the use of herbicides on preserves.

Sincerely,

Sandra Guldman

Sandra Guldman
Vice President

RESPONSE TO COMMENT LETTER 10 - SANDRA GULDMAN, FRIENDS OF CORTE MADERA CREEK WATERSHED, JULY 8, 2015

Response to Comment 10-1

The change in the name of California clapper rail, now renamed as Ridgway's rail (*Rallus obsoletus*), is noted. The California Department of Fish and Wildlife's (CDFW) "Special Animals List" (dated April 2016) still uses the name California clapper rail in identifying this species.

Response to Comment 10-2

The commentor is correct that there are other invasive cordgrass species found in Marin County, in addition to *Spartina alterniflora*, that hybrids between native cordgrass (*Spartina foliosa*) invasive cordgrasses can be difficult to identify and may require DNA analysis to discern, and that funding is crucial for effective control of the invasive non-native species of cordgrass. Data on the distribution and threats posed by non-native invasive species is updated by the MCOSD as it becomes available. The VMBP calls for system-wide monitoring of invasive plants for early detection and rapid response, and lays out project-specific monitoring protocols. This improved framework of monitoring will serve to update data on the invasive species and risks to sensitive natural resources and biodiversity of the MCOSD preserves.

Response to Comment 10-3

The opinion of the commentor over the importance of including chemical treatment as an option to control and eradicate invasive species, and that herbicide use should be limited and used only when other methods are not adequate to control infestations is noted. As well as their support for revisions to **BMP-Sensitive Natural Resources-1** called for in under Mitigation Measure 5.1-1 of the Draft TPEIR when treatment would occur within the 100-foot buffer around sensitive natural resources.

Response to Comment 10-4

Comment noted. See **Master Response 7 - Hydrology and Water Quality**. The suggested BMP regarding tidal herbicide applications has been added to the text of the revised Mitigation Measure 5.2-1.

Response to Comment 10-5

Comment noted.

Response to Comment 10-6

The commentor is correct that the U.S. Fish and Wildlife Service (USFWS) typically requires a 700 foot setback of construction or other disturbance within known or suspected nesting habitat for Ridgway's rail, and that construction setbacks from raptors is often times greater than 100 feet. The buffer distances called for in the various BMPs in the VBMP are minimum distances that would be adjusted based on site-specific conditions as part of project planning process as necessary to adequately protect sensitive natural resources and ensure compliance with applicable state, federal, and local regulations. Protection and enhancement of native biodiversity are primary goals of the draft VBMP, including sensitive natural resources such as essential nesting habitat, and no changes in the BMPs contained in the draft VBMP are necessary in response to the comment.

Response to Comment 10-7

The concerns of the commentor over the potential for introduction of invasive organisms, degradation of habitat and possible mortality of wildlife as a result of trail and off-trail use on MCOSD preserves is noted. The revisions to BMPs called for in Mitigation Measure 5.1-4 of the Draft TPEIR were recommended to address potential impacts of implementing the VBMP, which does not include trail and general public access to MCOSD preserves. These issues were addressed as part of the *Road and Trails Master Plan*, and this comment is not related to the adequacy of the Draft TPEIR.

Response to Comment 10-8

The Draft TPEIR does acknowledge potential impacts associated with the existence of landslides and unstable colluvial deposits found throughout the MCOSD preserves (see *Impact 5.3-1 Slope Instability and Landsliding*). Soil erosion impacts due to the existence of a variety of surficial soil units susceptible to erosion in several of the MCOSD preserves is also acknowledged in the Draft TPEIR (see *Impact 5.3-2 Soil Erosion*). Implementation of several of the BMPs in the draft VBMP together with recommended mitigation measures (see Mitigation Measure 5.3-1) would reduce these impacts to a less-than-significant level. The suggestion by the commentor that the MCOSD address erosion and sedimentation issues not associated with implementation of the VBMP, such as through the *Road and Trails Management Plan* or through restoration projects undertaken to manage vegetation and biodiversity, is noted. This comment, however, is not related to the adequacy of the Draft TPEIR.

Response to Comment 10-9

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion of alternatives and the herbicide-free approach.

Comment Letter 11

Marin Audubon Society

P.O. Box 599 | Mill Valley, CA 94942-0599 | marinaudubon.org

July 8, 2015

James Raives
Marin County Parks
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903

RE: Comments on Vegetation Management Draft Tiered Programmatic Environmental Impact Report

Dear Mr. Raives:

The Marin Audubon Society appreciates the opportunity to comment on this Draft Tiered Programmatic Environmental Impact Report (DTPEIR) for the Marin County Vegetation and Biodiversity Management Plan (VBMP). We support the laudable goals of the plan, although we recommend that Goal #2, "manage vegetation for the preservation and protection of native habitats and native species," be moved to #1. The Open Space District (OSD) has broad responsibility to maintain and support all native plant and animal species on its preserves. In particular, its responsibility extends beyond protecting vegetation and special status species, as reflected in the VBMP, and should extend to protecting all native species and native habitat communities on OSD preserves. While the VMBP has many positive provisions, it also has a number of deficiencies that are discussed below in these DRPEIR comments.

11-01 The purpose of the Plan is stated, but how biodiversity is defined is not. The VBMP and the DTPEIR should define biodiversity and explain why the wildlife component is basically ignored. The statement of purpose of the VBMP does not even include wildlife. How can the goals of protecting biodiversity be achieved if one of the primary components is virtually ignored? Both plants and animals are integral parts of native ecosystems.

The following deficiencies should be addressed:

11-02

- To meet the goals and purposes of the VBMP, a broad approach should be used in making decisions about which habitats to protect. The DTPEIR needs to discuss how the OSD decides which habitat types to protect. For example, when Douglas fir invades grassland, how is it decided which habitat type should be chosen to dominate/remain? Some of Marin's habitat types and species, including redwoods and chaparral vegetative communities may seem or maybe abundant in Marin but on a regional, statewide or national level they are rare or non-existent.

Table B.1 Vegetation Types on Preserves notes the global and state ranking of species but it is not clear how their status is considered in decisions about removing, retaining or encouraging. A particular habitat type.

11-03

- The DTPEIR does not address wildlife in any meaningful way. It is explained that there is insufficient information about wildlife use, but this is clearly untrue. Table 2.1 of Preserve Conditions lists at least special status species known to be on preserves. There are OSD staff that are knowledgeable about species presence, birds sightings reported by expert birders on the internet, Audubon Christmas Bird Counts, as well as surveys the OSD has had conducted by Point Blue.

The discussion should be expanded to address the importance of wildlife as part of the biodiverse ecosystem, the importance and interdependence of wildlife and plants, and about the importance of maintaining vegetation and wildlife as part of a healthy ecosystem. The discussion should address the interdependence of vegetation and wildlife. Most species of wildlife depend directly on vegetative habitat for their life cycle needs to nest, feed, rest, cover and to move among habitats. Vegetation specific to species needs is essential for wildlife survival.

Wildlife also affect vegetation. Wildlife fertilize plants, disburse seeds, and control the growth and expansion of plants. The absence of top predators, for example, can result in over-grazing or browsing, and the subsequent loss of important understory vegetation needed by some species to survive.

11-04

- the importance of vegetation to the human population: erosion control, air quality, climate moderation, visual benefits, and carbon sequestration. There is a good discussion on the importance of native vegetation for resilience to climate change, but the many other benefits of native vegetation should also be discussed. The dominant approach is one of eliminating vegetation to address the threat of fire to the exclusion of benefits of retaining the vegetation.

11-05

- stressors impacting biodiversity -- The VBMP (chapter 3) begins with a review of the approaches of thirteen open space management agencies. As described, each of the land managers interviewed emphasized the importance of addressing stressors and preventing problems to protect habitats (page 3-13). The interviewed agencies believe that "preventing invasive plant infestation is the key to managing fuel loads and protecting biodiversity…." All of the agencies agreed that the most effective approach for managing the harm caused by invasive plants is to prevent the invasion from happening…", "…prevention as (is the key to ecosystem health…." It is "less costly to avoid the harm that invasives cause, and avoid the use of chemicals."

Yet there is virtually no discussion of the impacts of other stressors on native habitats: visitor uses, off-trail use by walkers, bikers, and dogs that trample and destroy vegetation and transport seeds, illegal trail construction, as well as new or expanded trail construction. The discussion should address the adverse effects of these visitor uses on vegetation,wildlife and wildlife habitats. The impacts that should be addressed include destroy vegetation by trampling, transporting seeds, opening new pathways for invasives, erosion and sediment deposition.

11-05 (cont.)

The extensive network of unauthorized trails at Ring Mountain resulting from off-trail use, for example, has destroyed habitat, created pathways for invasive plants and erosion, disrupted habitats and possibly impacted endangered plants.

Also, only "redundant or environmentally undesirable" trails and roads in the Legacy Zone are identified for evaluation (and only evaluation) for decommissioning. Removal of trails in all zones should be considered possible. What makes a trail environmentally undesirable, how it impacts vegetation and wildlife? Only vegetation removal methods are addressed in any meaningful way. Ways to avoid these impacts and prevent them from occurring in the first place should be addressed.

11-06

- avoiding or preventing impacts. Avoidance is the preferred mitigation in CEQA.

Ways that the impacts could be avoided or significantly reduced are not addressed. The following mitigations should be discussed: enforcement of off-trail use restrictions by all users, trail closures, dogs-on leash, and bikes only on authorized trails and making sound decisions on new or expanded trails should be addressed or addressed more thoroughly.

11-07

- habitat restoration as a means to the goal of biodiversity. Wetland restoration is

mentioned in a BMP, but it is not just wetlands that can and should be restored. Many areas of stream as well as upland habitats would benefit from restoration or enhancement. Most of the discussion in the VBMP (pages 4-29- 31) deals with the assessment and the mechanics of restoration.

11-08

The DTPEIR should discuss vegetation opportunities and how to facilitate habitat restoration to benefit wildlife. The OSD should have a vision that includes areas where there are restoration needs and opportunities. For example, locations where invasives are removed would seem to be optimum locations for habitat restoration by revegetating which would also guard against reestablishment of the same or establishment or other invasive plants which occurs in disturbed areas. The OSD is technically skilled at closing and restoring trails. This skill should be used to benefit habitats and wildlife in invasive removal areas.

SUBSEQUENT ENVIRONMENTAL REVIEW

11-09

Because this is a tiered programmatic EIR, there will need to be future CEQA consideration for specific projects. The TPEIR should discuss how the OSD will decide on the level of CEQA review needed for future individual projects. How will it be decided and by whom whether a Categorical Exemption, Negative Declaration or an EIR would be needed? The decision matrix Table 4. only asks for benefits – it does not record impacts.

11-10

Further, how the CEQA compliance documents will be available to the interested public for comment should be described.

Our specific comments on DPEIR chapters are follow:

BIOLOGICAL RESOURCES

Special Species
This section discusses the presence of special status fish species and notes also (page 119) "the MCOSD also monitors locally rare and unique species on its preserves…." and that these are presented on various tables.

11-11

The discussion is confusing and creates uncertainty. The notion that "systematic surveys" are required to confirm presence or absence is invalid. If a special status species is not found on systematic surveys, it does not mean they are not present. There are many well qualified experts at identifying avian species even on staff of the OSD (see discussion page 2). CNDB is cited and then it states that their results are inconclusive. Several tables in the DTPEIR Appendix B and VBMP Table 2.1 has a column entitled "Known Special Status and Locally Rare Species" in which such species are listed for each preserve. The DTPEIR should discuss measures that will assure protection of each of these species on each preserve on which they are located.

Habitat Connectivity (page 119)
This section discusses connectivity between habitats and emphasizes that connectivity is necessary to allow wildlife to move between habitats. It should be acknowledged that the movement corridors themselves are habitats and these habitats also should be protected as well. The discussion should also recognize the movement corridors are themselves habitats. The discussion does recognize that "appropriate controls on habitat management practices such as maintaining essential protective cover… are an important consideration in protecting and enhancing opportunities for habitat connectivity."

11-12

Review of Specific Impacts

Impact 5.1.1 Special Status Species - Impact of management activities could result in loss of population or habitat for special-status species.

The discussion does a good job addressing the impact of management/construction activities through the use of timing, technical procedures, sighting, buffers, etc. BMPS 7. 7.2 special status BMPs address important actions that should be taken to minimize or avoid construction impacts of a project. This discussion and the mitigations are based on the assumption that the management action will be taken. The discussion should back up a step and address the decision to proceed with a project that will have impacts, i.e. whether the project should proceed at all, how it would be evaluated to ensure impacts are avoided where possible or are otherwise reduced and mitigated.

11-13

The Prioritization Process discussion in the VBMP and Table 5.2 Project Ranking System appears to be the decision-making tool, or one of them, for projects. We have a number of problems with using this form to guide decisions. The Table has a category "Threats to Natural Resources," which should actually be entitled "Benefits to Natural Resources". The Sensitive Biological Resource section, is far too limited. It only addresses locally rare and special status

11-13 (cont.)

species. In addition, there are potential conflicts between some of the ranking categories; for example between special status species/natural resources and fuel reduction projects, and between recreational improvement projects and natural resource protection. How would these conflicts be shown on the form and how would they be ultimately be resolved? Further, there are no categories or criteria showing adverse impacts to species or habitat. A project could benefit water quality/while at the same time adversely impact special status species that rely on nearby upland habitats. Adverse impacts that could occur include: removing vegetation to reduce fuel could impact prey species and constructing recreational trails would remove vegetation and /or attract more visitors to a sensitive nesting area. Please discuss these questions about the adequacy of the Ranking System table. .

Mitigation Measures 5.1-1 (a) and (b) list a number of BMPs. These measures only address construction related impacts, not the ongoing impacts from the stressors associated with expanding trails, people use and off-trail use as discussed above.

A mitigation should be included. as is recommended by CEQA that avoids impacts by, for example, not constructing or expanding trails near special status species habitat. The spotted owl BMP, for example, calls for avoiding work during nesting season, buffer of 100 feet at least around nests, etc. but does not recommend or allow for the option of avoiding new trails or even closing trails near nests. The discussion only addresses construction related actions to protect this special status species once the decision to construct has been made, but not whether the project should occur at all.

Actions should be included that will avoid impacts, i.e. not expand trails. The effects of visitor uses should be identified and discussed as impacts. Mitigation, in particular by in creasing enforcement and avoiding impacts, should be recommended.

The decision-making process should be discussed and the decision/ranking form, if it continues to be used, it should be revised to ensure that potential adverse impacts are adequately identified and that it allows for and encourages a text description and evaluation of the significance of benefits/impacts. A check or ranking number does not fully address the potential adverse impacts, nor would it comply with required CEQA analysis.

BMP Natural Resources 1 calls for assessing the proposed action/project and suggesting actions that "may" be taken to help ensure avoidance of impacts. This BMP is insufficient. None of the proposed actions would be required, therefore, the presumed benefit is uncertain at best and not sufficient to ensure the impact would be reduced to less-than-significant.

One of the BMPS Under Natural Resources 1 requires "compensatory mitigation where the adverse effects on sensitive natural resources is unavoidable." What does this mean? A comprehensive discussion is needed that addresses the kind of mitigation that would be required for specific habitat loss impacts. This is particularly important for upland habitats. Specific criteria should be identified to define when mitigation is needed and standards to define the nature of the mitigation will be required. The mitigation ratio, acreage, habitat type and potential location should be recommended as guidelines for projects. For example, at least a 2:1 ratio of replacement in-kind wetlands should be required for the loss of wetlands in the CWP but there is

11-13 (cont.)

no mitigation references for upland habitats. General standards are essential to ensure that a mitigation will take place and that it will be adequate. Also, how these decisions would be made about the nature and quantity of mitigation so that the public can be informed and participate should be stated.

Due to the above uncertainties and deficiencies, this impact cannot be considered reduced to less than significant, even with the proposed mitigation measures.

11-14

Impacts 5-1-2 Sensitive Natural Communities – related to management activities include treatment that could result in the loss or damage to sensitive natural communities.

How the adverse impacts from fuel reduction measures to native plant communities would be avoided or minimized should be addressed.

Sweet fennel is an upland species and is not found in salt marshes as stated at the end of the first paragraph on page 138.

The reference to mitigation measure 5.1.1 in Mitigation 5.1.2 is unclear. The discussion should describe how mitigation 5.1.1 will ensure adequate protection of sensitive natural resources and consider as well our comments on the adequacy of Mitigation 5.1.1 above.

As there is no clear procedure to evaluate whether projects with adverse impacts to sensitive natural communities will be avoided, any certainty that avoidance will be considered, or that adequate mitigation for proposed projects will even be provided, it cannot be concluded that this impact will be less-than-significant.

11-15

Impact 5.1.3 – Wetlands and Other Waters
As discussed above, it is unclear how Mitigation Measure 5.1.1 would ensure adequate protection of sensitive wetland and other water resources. Please provide an adequate explanation.

Although maintaining a 100 buffer zone from wetlands is generally recommended to protect the wetland habitat from impacts of public use, it is impossible to maintain biodiversity and maintain the recommended 100 foot buffer zone from wetlands because there are several wetland plants, the highly invasive Spartina and perennial pepperweed, that threaten the very existence and survival of our native tidal marsh species. The body of literature and experience is clear that these species must be treated with herbicides if they are to be successfully eradicated or even controlled.

BMP General-7 recommendations are vague. The mitigation measure should describe, at minimum, the timing of herbicide application, method of application (so that the public does not believe there is aerial or even ground spraying) and measures to keep the public out of application areas.

Impact 5.1-4 Wildlife Habitat and Movement Opportunities

We agree (Fuel Management BMP-13) that substantial modifications to native wildlife habitats as a result of fuel management in defensible space zones" is not only possible but probable. The significant increase in fuel breaks and other fuel modification acres from 100 in 1994 to 528 in 528 acres currently reflects the increasing impacts of fire reduction activities on habitats. Are fire agencies continuing to consider increasing the number of fire breaks? If so what acreage increase should be expected? Would these increases be in all zones?

11-16

The guidance to property owners to break up continuous vegetation will have significant impacts on native wildlife. There should be a discussion of the potential acreage that would be lost by clearing for wide fuel breaks and this defensible space and the species that would be adversely impacted by implementing these fuel reduction measures.

This section should discuss the potential impacts of fuel breaks on native habitats and species. The discussion should include the areas that are proposed to be cleared to expand fuel breaks and areas that need to be treated in some way to maintain fuel breaks. The potential habitat and wildlife impacts of these significant modifications that would be expected from expanding and maintaining fuel breaks should be addressed.

Wildlife species that would be adversely impacted would include all ground dwelling species, including native birds, mammals, reptiles, and amphibians, that require vegetation for nesting, foraging and cover to avoid predators, such as quail, towhees, wood rats, mice, raptors that feed or small rodents. The loss of nesting resting and foraging habitat by removing trimming, and thinning plants could result in a significant reduction of populations of species that depend on these habitats.

To comply with BMP Natural Resources 1, a discussion of the type and characteristics of mitigation that would be required for removing native vegetation for fuel reduction purposes should be discussed. What mitigation measures would compensate for the loss of different habitat? As discussed under Habitat Connectivity above, both the connecting corridors as well as the habitats they connect are essential to protect, and impacts to these resources should be identified as significant and avoided.

HYDROLOGY

The Water Quality BMP-discussion Special Status Wildlife Species – BMP 3 is cited covering cormorant and heron/egret rookeries. Spotted Owl and Ridgway's Rails should also be discussed. BMP Invasive Plant – 1 recommends an IPM approach. IPM is described as "a long-term, science-based, decision-making system that uses specific methodology to manage damage from pests, including invasive plants."

11-17

There should be a more detailed discussion of the steps that are taken to decide to use an herbicide as well as of the application methods to be used. This should help some members of the public to understand that herbicides are used as a last resort, only when no other method is feasible, and that herbicides are not administered in a manner that is harmful to people and wildlife (i.e. sprayed).

Review of Specific Impacts

Impact 5.2-1 Water Quality/Waste Discharge Requirements
What is the scientific basis for the risk assessment proposed to be used for biological receptors? Has this risk score assessment tool been peer reviewed?

11-18 Mitigation Measure 5.1.1 is cited here and for many other impacts. It includes various BMPs and requires preparation of a written treatment program. Discuss how this very general mitigation applies to and will mitigate for this specific impact. Also, how would the treatment program be provided for review by the public?

There is considerable discussion about using a 100-foot buffer from a water body and that this buffer would provide for degradation and sequestering of ingredients and reduce the risk of spills from herbicide use. As discussed above, it is not always possible to provide a 100-foot buffer and treat highly invasive plants. There should be a description of the potential impacts if these particular aquatic plants (Lipidium and non native Spartina) are allowed to go untreated, and why they cannot be eliminated or even controlled by methods other than treatment with herbicides.

As noted above, the detailed description presented here only addresses procedures after it has been decided to use herbicides. Please provide information about the steps the OSD takes leading up to the decision to use herbicides.

Impact 5.2-3 Degraded Water Quality and Substantial Additional Sources of Polluted Runoff

11-19 Measures included in Mitigation Measure 5.1-1 and 5.2.1 are cited again as reducing the risk of water quality impairment by contaminated runoff and reducing the potential impact to less than significant. Please provide a more specific explanation as to why these measures are expected to mitigate this impact.

HAZARDS - Fire

11-20 As we understand, current thinking and research indicates that smaller areas of defensible space are more effective in preventing fires than wide fuel breaks. It is also our understanding that this was the recommendation of the OSD Director as it was presented to the BOS a short while ago. Why has the approach now reverted to emphasizing wide fuel breaks? What is the current research and professional opinion about the value of fuel break? Does current thinking support the value and use of wide fuel breaks?

11-21 The discussion of high fire risk locations (page 206), some of which are identified as redwood forest habitats, should address the resistance of redwood trees to fires. This species grows only in fog-dominant north slopes which one would think would reduce fire danger. Yet Baltimore Canyon and the Giacomini Preserve are identified as having a high fire danger (pages 206 and 211). Discuss the fire resistance of redwood trees and the climactic conditions that supports them as contributors to minimizing fire threat. Also, why are these naturally more moist, fog laden

11-21 coninued

communities not differentiated from hotter communities such as San Rafael and Novato? We would expect that the risk would be different?

11-22

The impact of fire on structures is the focus of the analysis. Discuss the effect of proposed fire suppression treatments and programs on native habitats and the species that depend on them. As described in the VBMP primary and secondary wide fuel breaks would range from 60 to 200 feet wide. Identify the native vegetative habitats and acreage that would be impacted by the various fuel management strategies: defensible space, fuel breaks, ignition prevention zones. Discuss the vegetative and wildlife species that would be affected by the removal of native vegetation? Evaluate the significance of this impact on plant and wildlife populations. For example, some species depend on shrubby understory for nesting and foraging for all or most of their life needs. For these species, the habitat loss would be significant. Others benefit during shorter periods, i.e. from a closed canopy to occasionally hide from predators. All species that depend on these habitats would be adversely impacted.

11-23

Discuss the place of fire in maintaining the ecosystems of the preserves. What habitats benefit from fire? Are there any locations where fires could be allowed to some extent to burn?

11-24

The proximity to a fire station may have significance in the ability to fight fires. Are there fire stations close enough by any of the preserves to reduce the need for fuel reduction treatment?

11-25

The first sentence of the paragraph just above wide area fuel breaks on page 224 – states "…a comprehensive set of environmental fire-fighting effectiveness, and budgetary factors would be considered:" in maintaining and constructing old and new fuelbreaks. Punctuation is important here. Is the factor supposed to be environmental, fire fighting effectiveness or, as stated, environmental fire-fighting effectiveness? If the latter, please describe what that means?

11-26

The discussion on page 226 speaks to cutting broom and eucalyptus. Address the effectiveness of cutting to remove broom. In our experience, it simply results in a more complex root and branch structure which makes it more difficult to remove once again unless cut again or treated with herbicides. Further, any broom, acacia and eucalyptus that is cut will need to be treated with herbicides or will have to be cut repeatedly.

11-27

According to the VBMP, wide area fuel breaks would be on public land often on ridgetops alongside roads, whereas defensible spaces are planned for around private residences which presumable would maintain them, or at least be required to. What if residents, who may change frequently, do not reliably maintain the defensible spaces?

11-28

Please explain the matrix decision making table (Table 4.9) for fuelbreaks. The evaluation of these factors is not as simple as can be presented and assessed in a table format. Some of the factors, particularly the presence of endangered species has a high ranking which seems to give more weight to destroying habitat to construct fuelbreaks. Because endangered/special status species are protected by federal and state law, their presence would seem to be a primary deterrent to removing their vegetative habitat. The presence of important local native vegetative habitat is not mentioned. Also, why would enhancement of defensible space necessarily have a

11-28 (cont.) high value when it may be redundant and, therefore, not needed? Provide a more comprehensive evaluation of the adequacy and effectiveness of this approach.

Review of Specific Impacts

Impact 5.4.1 Vegetative Fuel Management Strategies contained in the Draft VBMP that would reduce the risks and hazards of wildlife and therefore reduce exposure of people or structures to significant loss, injury or death from removing understory shrubs including broom are removed.\

11-29 Please provide a listing of proposed new fuel break locations that could occur and identify which ones have already been approved. Describe the condition of these areas, i.e. presence of native and non-native species that would be removed and maintained for defensible space zones and fuel breaks.

Table 5.1 contains all projects. Specific projects for wide –area fuel break management for Baltimore Canyon, Blithedale Summit and Camino Alto Fire Road are called out. Why would these preserves, which are primarily in the fog zone, have a need for further fuel breaks?

Maintaining fuel breaks to be devoid of vegetation is an ongoing, time consuming and overwhelming task for the OSD, taking away resources needed to restore and maintain habitats. This would be exacerbated if herbicide use is banned. The vegetation removed or thinned will grow back or another species, perhaps an even more flammable invasive specie, will grow. Barren ground is not common in nature.

Removing vegetation to reduce fuel will impact the OSD by generating considerable costs for maintenance. The EIR should discuss cost as an impact and identify mitigation. A mitigation that should be considered and discussed is the Fire District assuming responsibility for ongoing maintenance of these areas. The responsibility, in our view, for maintaining any fuel reduction zones free of vegetation, should be with s the agency that required the action to be taken. The DTPEIR should recommend as mitigation that fire departments fund any vegetation removal approved and maintenance required. Further, any vegetation removal on OSD preserves should be done under the supervision of the OSD.

11-30 **Mitigation Measure 5.4-2 Vegetative Fuel Management Strategies that are incomplete** or insufficient could increase wildlife hazard.

Two requirements for converting or restoring a fuel break are identified (DTPEIR page 239) – a preserve wildfire protection plan and conversion in acceptance of the plan jointly with the fire agency. We support these requirements but also ask: do these requirements mean that the fire agency will assume responsibility? What public review of these plans will be conducted?

A possible impact not identified in the DTPEIR is spreading diseases, particularly phytophtera, by removing cut limbs and chippings from clearing for fire truck access. Many of the oaks and other trees in Marin are infected with this diseases. Where are the trimmed limbs and chippings

11-30 (cont.) being disposed by fire departments so as to ensure they do not spread the disease. Professional advice has been to keep infected trees on-site.

Hazard – Herbicide Use

11-31 Please explain how the OSD complies with, or whether it is or is not required to comply with, the county's IPM ordinance. At a recent Supervisor's meeting a member of the public stated that the OSD was not subject to this ordinance. However, the discussion on page 245 states the "IPM ordinance directs all county departments performing pest management activities to utilize IPM practices…how pesticides may be used."

11-32 The discussions related to IPM in the DRPEIR address application methods, species of plants to be treated, and procedures after it is decided to use herbicides. Non-herbicide treatment alternatives including pulling and cutting, are listed in various places but there is no comprehensive description of the process that should be followed leading up to the decision to use the herbicides used by the OSD. As discussed above, a the EIR should present a description of the process used for determining treatment methods (including experiences, literature search, scientific studies), and when to move to the next level. What factors are taken into consideration as part of the decision to use pesticides?

11-33 Provide information on the life span of herbicides applied to plants. How long would the herbicides be expected to persist in the environment? What is the usual life of glyphosate and other herbicides used by the OSD and what factors could lengthen or shorten the effective life. Cite literature and information do the manufacturers provide? If there are significant differences, discuss the longer and shorter lasting ones?

11-34 Herbicides are described as being "highly selective to plants," "practically non-toxic to humans and animals" and "generally not posing unacceptable risk to humans." Describe circumstances under which humans could or would be at risk from pesticides.

11-35 How are the herbicides used by the OSD similarly or different than DDT that was the major concern back in the time of Rachael Carson's writings.

Review of Specific Impacts

Impact 5.5.1 Impacts to Ecological Receptors

11-36 Regarding the statement "Generally herbicides are practically non-toxic to humans and animals…." What circumstances would have to exist for most herbicides to be toxic?

Again, Mitigation Biological Resources 5.1.1 is cited which calls for preparation of a treatment program. This Mitigation is recommended for many impacts. Explain how Mitigation 5.1.1 would effectively mitigate this adverse impact. What review and assurances will assure that such treatment programs are adequate and that they would be followed?

11-36 (cont.)

Mitigation Measure 5.5-1 BMP-Invasive Plant-2 calls for limiting herbicide use within a minimum100 foot buffer from sensitive receptors which would include wetlands and other aquatic resources.

11-37

As mentioned above, there are species (Lipidium and Spartina) that cannot be eliminated or even controlled without the use of herbicides. These that are aquatic species. Measures including timing to avoid nesting season and high water levels, should be discussed for impacts to aquatic resources.

The herbicide application decision tree (exhibit 5.5-8) does not appear to have a step that ensures that the herbicide would be applied using the most targeted, minimal amount necessary to achieve results. The decision tree should not begin with application, but should include, as noted above, the steps according to the IPM approach that lead up to the decision to use herbicides. In other words, it should demonstrate that all other mechanical and cultural methods have been considered. It also should include a step to ensure the application is made by an experienced professional and that the public does not have access to the application area and

How much in advance of the application should notices be erected to inform the public and tell them to stay away? Signs themselves are probably insufficient. Other markers such as tape or temporary fencing should be installed around the area to be treated.

11-38

Impact 5.5-2 Applicator and Preserve User Exposure

Provide examples of species that would require the use of rope wick and foliar applications and why. On what species would other methods be used?

ALTERNATIVES ANALYSIS

11-39

The Alternatives are strained, complicated and difficult to understand. In some parts of the description, an alternative appears beneficial for some components and then in others that same component seems detrimental.

We recommend that an alternative be developed in which : 1) defensible spaces are depended upon, in accord with current experience of firefighters nationwide, with only the most crucial fire roads retained and all others closed, particularly those on ridgetops, 2) there are no new wide fuel breaks be constructed, 3) there is continued use of selected herbicides on selected species applied under a IPM approach, and 4) that addresses and mitigates for all stressors to vegetative habitats and wildlife. Such an alternative would more clearly and strongly protect the diverse vegetative and wildlife habitats while providing necessary fire protections. .

Thank you for considering our comments and questions.

Sincerely,

Barbara Salzman, Co-chair
Conservation Committee

Phil Peterson, Co-chair
Conservation Committee

RESPONSE TO COMMENT LETTER 11 - BARBARA SALZMAN AND PHIL PETERSON, MARIN AUDUBON SOCIETY, JULY 8, 2015

Response to Comment 11-1

The opinion of the commentor that the "wildlife component is basically ignored" in the VBMP and Draft TPEIR is noted. Please see **Master Response 8 - Biodiversity Issues** for a response to this comment. Because the VBMP does in fact include a definition of biodiversity, the Draft TPEIR does not need to repeat this definition. Goals 2 and 3 in the VBMP address "native habitat and native species", which encompasses both plant and animal species. It does not exclude animal species or wildlife, as claimed by the commentor. Providing improved vegetation management practices, invasive plant species control and eradication, and natural resource restoration called for in the VBMP all serve to enhance conditions for both the native plant and wildlife species found in the diverse vegetation management zones on the MCOSD preserves.

Response to Comment 11-2

The commentor is correct that to meet the goals and purposes of the draft VBMP, a broad approach must be used in the decision making process. Chapter 3 of the draft VBMP provides a discussion of regional trends and evaluates current vegetation management practices that will be used to guide the decision-making process of the MCOSD. Chapter 4 of the draft VBMP describes the framework for vegetation and biodiversity management, the four vegetation management zones based on the ecological and/or cultural importance of their vegetation types, the condition of their resources, and their proximity to urban and suburban development. The management zones are intended to provide the MCOSD with landscape-levels tools to help prioritize management actions, with the objectives summarized in Table 4.1 (Vegetation Management Objectives by Zone). And the inventory, assessment and monitoring called for in the draft VBMP will inform the decision-making process as treatment priorities are reviewed on an annual basis. The ranking of vegetative cover types in Table B.1 (Vegetation Types on Preserves in Appendix B of the VBMP) is just one of the many data to be considered in the decision-making process as management activities are prioritized and specific projects reviewed, refined and implemented consistent with the BMPs and policies of the VBMP. This comment, however, is not related to the adequacy of the Draft TPEIR.

Response to Comment 11-3

Please see Response to Comment 11-1. It is unclear what reference the commentor is making to claims that "there is insufficient information about wildlife use" in the Draft TPEIR, as a summary of the characteristic wildlife species associated with each of the major vegetative cover types is provided.

Response to Comment 11-4

The commentor is correct that native vegetation is important to humans for a number of reasons, but the purpose of the Draft TPEIR is to evaluate potential impacts of the draft VBMP, including adverse effects on vegetation and wildlife resources as provided in the Biological Resources section of the Draft TPEIR. The commentor is also correct that prevention is the most effective method of managing the damage cause by invasive species establishment. This issue is discussed under "Prevent the Introduction and Spread of Invasive Species" on pages 4-35 and 4-36 in Chapter 4 of the draft VBMP. **Table 5.1** (*List of Potential Projects to be Implemented in the VBMP*) includes the "District-Wide Early Detection/Rapid Response Program Implementation" and "District-Wide Invasive Plant Rapid Assessment" as the two overarching invasive species control projects, together with target species and locational invasive species treatment programs. A program for implementing a systemwide early detection of invasive plants and rapid response is discussed on pages 6-5 and 6-6 of the draft VBMP. This comment, however, is not related to the adequacy of the Draft TPEIR.

Response to Comment 11-5

The commentor is correct that visitor use activity can have a substantial adverse impact on local biodiversity and could result in damage and or loss of sensitive natural resources. However, they are generally not relevant to the vegetation management activities addressed under the VMBP. These issues were addressed as part of the *Road and Trails Management Plan*, and this comment is not related to the adequacy of the Draft TPEIR.

The commentor raised a question regarding potential impacts associated with the removal of trails. The relationship of the draft VBMP to the MCOSD Road and Trail Management Plan is discussed on page 74 of the Draft TPEIR. As stated there, **Table 5.1** (*List of Potential Projects to be Implemented*) in the draft VBMP identifies vegetation projects that may include the decommissioning of some roads or conversion of roads to trails. However, the MCOSD will implement all road or trail modifications (e.g., road or trail decommissioning, relocation, or road-to-trail conversion) through its RTMP. [80]

Response to Comment 11-6

Please see Response to Comment 11-5. The Draft TPEIR provides a detailed analysis of the potential impacts of implementing the draft VBMP, including contemplated vegetation management activities. The inventory, assessment and monitoring described in Chapter 4 of the draft VBMP would serve to provide the data used in the protection and restoration activities called for as part of the natural resource management activities, and would inform the decision-making process as treatment priorities are reviewed on an annual basis. Many of the BMPs in the draft VBMP focus on avoidance and minimizing potential adverse effects on sensitive natural resources, addressing the concerns of the commentor where related to management activities related to implementation of the VBMP. This comment, however, is not related to the adequacy of the Draft TPEIR.

Response to Comment 11-7

The commentor is correct that habitat restoration can and should include not just wetlands but riparian and upland habitats as well, which is recognized as an integral part of the VBMP. The discussion of "Natural Resource Management (Protection and Restoration)" on pages 4-23 to 4-31 of the VBMP is not limited to wetlands, with the objective of proactively restoring high-value habitat and native biodiversity on the MCOSD preserves. This comment, however, is not related to the adequacy of the Draft TPEIR.

Response to Comment 11-8

As discussed in Response to Comment 11-7, a primary objective of the VBMP is to proactively restore high-value habitat and native biodiversity of the MCOSD preserves. The invasive species treatment and disturbance associated with habitat restoration are discussed in detail in the Draft TPEIR as components of the VBMP. But the purpose of the Draft TPEIR is to assess

[80] Memo to Bob Berman from James Raives, Senior Open Space Planner, Marin County Parks, April 30, 2014.

these potential impacts of the VBMP as a project, and inform the public and decision-makers with the significance of these impacts, not to provide additional discussion of “vegetation opportunities and how to facilitate habitat restoration to benefit wildlife”, as suggested by the commentor.

Response to Comment 11-9

The steps to determine the appropriate level of environmental review for subsequent activities regulated by the VBMP are described on page 76 of the Draft TPEIR. As stated, subsequent actives must be examined in light of this program EIR to determine whether an additional environmental document must be prepared according to *State CEQA Guidelines* Section 15168(c).

Response to Comment 11-10

Notice regarding the availability of CEQA documents would be provided consistent with the *State CEQA Guidelines* and MCOSD procedures.

Response to Comment 11-11

The discussion of special-status species in the **Section 5.1 Biological Resources** of the Draft TPEIR is intended to provide a context for assessing the potential impacts of the VBMP on the variety of special-status or locally rare plant and animal species. As acknowledged on page 119 of the Draft TPEIR, while the CNDDB records provide the most extensive data on the known distribution of special-status species in the state, they are not conclusive in verifying presence or absence in a particular location. The CNDDB records also tend to focus on special-status species or those with a high inventory priority, and only provide data where previous encounters with these species have been observed and reported. Occurrence information for numerous species that are present in Marin County is underreported or not reported to the CNDDB. There remains varying potential for other special-status species to occur on MCOSD preserves, and more comprehensive and updated lists would be considered in advance of conducting systematic surveys before initiating habitat management activities associated with the VBMP.

The MCOSD is continuously updating information on special-status species known or suspected to occur on its preserves, and updated information will be used as part of project-specific review in preparing the required treatment plan. Future management activities contemplated under the VBMP would consider the potential implications on all special-status species known or suspected to occur on MCOSD preserves. The analysis of potential impacts on special-status species discussed under *Impact 5.1-1 Special-status Species* on pages 132 through 134 of the Draft TPEIR applies to all special-status species. This includes acknowledging the potential for direct loss of individuals or localized populations, elimination or degradation of essential habitat, and further isolation of subpopulations as a result of habitat loss and fragmentation. As discussed on page 134 of the Draft TPEIR, implementation of the relevant BMPs from the VBMP and conformance with relevant policies and programs from the *Countywide Plan* and VBMP would generally serve to avoid and minimize potential adverse impacts of vegetation management and other activities implemented under the VBMP.

Relevant BMPs in the draft VBMP acknowledge the need to determine whether any special-status species are present in the vicinity of anticipated treatment activity areas, and to provide appropriate avoidance and protection measures. However, as part of implementing projects under the VBMP and as part of any subsequent CEQA review, the MCOSD will consider the potential site-specific impacts to special-status species. If necessary, this will include considering the need for additional mitigation measures that result in further refinement of a number of BMPs to avoid impacts from specific treatments in the vicinity of special-status species and other sensitive natural resources. Several BMPs in the draft VBMP call for establishing a buffer of at least 100 feet around special-status species occurrences, or essential habitat features such as nests in active use. But the draft VBMP contains no details on how the MCOSD would implement exceptions to adherence of this 100-foot setback. This is necessary because other components of the draft VBMP would require activities within the buffer zone, especially where vegetation treatment may be necessary for invasive species control and eradication where they pose a substantial threat to the sensitive resource, or for essential fire fuel management activities.

The Draft TPEIR includes mitigation measures that would refine certain BMPs in the VBMP to further define management practices within the buffer areas around sensitive natural resources that would be necessary to ensure that no adverse secondary effects occur, including the potential to impact individual or occurrences of special-status species. Adoption of Mitigation Measure 5.1-1 in the Draft TPEIR, together with effective implementation of relevant BMPs and policies in the VBMP, subsequent CEQA compliance, and oversight by regulatory agencies entrusted with enforcement of state and federal regulations that address protection and management of special-status species, would reduce adverse effects on special-status species resulting from vegetation management activities of the MCOSD implemented as part of the VBMP to a less-than-significant level. The treatment program recommended in revisions to **BMP-Sensitive Natural Resources-1** would evaluate options for treatment and risk to sensitive natural resources, define a preferred treatment plan, identify controls for avoiding and minimizing potential adverse effect on the sensitive natural resource, provide details on any required compensatory mitigation, and would include requirements for monitoring. These controls would serve to ensure that necessary vegetation treatment, fire fuel management and other activities performed within the buffer area around sensitive natural resources would result in no additional significant impacts on biological resources, including special-status species.

Response to Comment 11-12

The commentor is correct that the MCOSD holdings, together with other protected lands and undeveloped lands that serve to maintain habitat connectivity and function as movement corridors, are habitat for wildlife themselves and should be protected for that reason as well. The discussion on page 119 of the Draft TPEIR was intended to acknowledge that these protected and undeveloped lands serve an important role for habitat connectivity, but obviously provide habitat for the resident and migratory wildlife species that occupy these areas. A detailed discussion of the varied natural communities found within the MCOSD preserves, including the diversity of both plant and animal species is provided on pages 106 through 114 of the Draft TPEIR.

Response to Comment 11-13

The commentor expresses concerns over the assumption that a management activity would be undertaken if there could be an impact on sensitive natural resources, questions the tools used in the decision-making process around specific management projects, and states that **BMP-Natural Resources-1** is insufficient to ensure that potential impacts would be reduced to a less-than-significant level. The commentor asks what the requirement for compensatory mitigation called for in the recommended revisions to **BMP-Sensitive Natural Resources-1** made in Mitigation Measure 5.1-1(a) means, they request a "comprehensive discussion" to address the kind of mitigation that would be required, and that the specific criteria should be identified to define when mitigation is needed and standards to define the nature of the mitigation. They also ask how decisions would be made regarding mitigation, so that the public can be informed and participate, which they believe should be stated.

Please see Response to Comment 11-11 and **Master Response 10 - Mitigation Measure 5.1-1(a)** for a discussion of the conclusion that potential impacts on special-status species would be reduced to a less-than-significant level and refinements to BMPs in the draft VBMP to address the need for compensatory mitigation where potential impacts on sensitive natural resources cannot be avoided.

With regard to concerns over **Table 5.2** (*Project Ranking System*) on page 5-29 of the draft VBMP, is not a decision-making tool, rather it is a sample ranking system that the MCOSD may use to set project priorities. It is not intended to provide an analysis of impacts but only a tool to help the District rank priorities. The commentor believes the "Sensitive Biological Resource" list in the table is "far too limited", that there are some potential conflicts between some of the ranking categories, and wants to know how these conflicts are shown on the form and would be ultimately resolved. Additionally, there is no ranking for broader categories in the table like "species or habitat".

In response to the comment, the MCOSD intends to add 'sensitive natural communities' to the list of sensitive biological resources in **Table 5.2** of the draft VBMP, but does not believe that "high bio diversity" is a definable term that would not duplicate the other recognized criteria if incorporated into the ranking system. **Table 5.2** is a living document that the MCOSD will refine over time as it considers new issues. The table is an example of a ranking system that the MCOSD will refine and update as part of the adaptive management operations of the draft VBMP, as new information on effectiveness becomes available during implementation, and to resolve any inconsistencies. It is one of many tools for MCOSD to use in making decisions on priorities among the broad range of potential projects to be implemented under the VBMP. It is not intended to evaluate the potential impacts of a proposed project, but would be used by the MCOSD in the informal project prioritization process, together with specific knowledge of the site and professional expertise as discussed in Chapter 5 of the draft VBMP. As noted by the commentor, projects that enhance wetlands and riparian corridors could receive a higher ranking than other projects that restore other sensitive natural communities, depending on their rarity and threats to the occurrence.

Use of **Table 5.2** by the MCOSD would not provide an environmental impact analysis or serve as some type of CEQA review of a proposed project, as suggested by the commentor. Once the decision is made to proceed with a proposed project, MCOSD must comply with the requirements of CEQA and provide subsequent review, where necessary. The process for review and approval of specific projects contemplated under the VBMP is relatively informal. Upon identifying need and parameters for a specific project, the MCOSD would then move them forward through the budget process. If included in the budget, staff would comply with the requirements of CEQA and any other regulatory requirements. If through this impact analysis, the MCOSD determines that the project results in significant impacts to natural resources that it cannot avoid or mitigate, the District may choose not to implement the project, depending on other factors, such as public safety or other benefits to special-status species.

Response to Comment 11-14

The commentor questions how adverse impacts from fuel reduction measures on native plant communities would be avoided or minimized, states that there is no clear procedure to evaluate whether projects with adverse impacts on sensitive natural communities would be avoided, that there is no any certainty that avoidance would be considered, or that adequate mitigation would be provided.

Please see **Master Response 10 - Mitigation Measure 5.1-1(a)** for a discussion of the conclusion that potential impacts on sensitive natural communities would be reduced to a less-than-significant level and refinements to BMPs in the draft VBMP to address the need for compensatory mitigation where potential impacts on sensitive natural resources cannot be avoided. As discussed in the Response to Comment 11-13, the process for review and approval of specific projects contemplated under the VBMP is relatively informal. Upon identifying need and parameters for a specific project, staff would then move them forward through the budget process of the MCOSD. If included in the budget, staff would comply with the requirements of CEQA and any other regulatory requirements.

The commentor is correct that invasive sweet fennel is typically found in upland locations. But this species is known to invade the edge of the upper marsh zone and adjacent uplands as well. Infestations of this species have become a severe problem in some locations, which is why it is referred to a target species for treatment in areas of coastal salt marsh vegetation on page 138 of the Draft TPEIR.

Response to Comment 11-15

The commentor questions how Mitigation Measure 5.1-1 would ensure adequate protection of sensitive wetland and other waters, requests an adequate explanation, and believes that the recommendations in **BMP-General-7** are vague, and must describe timing of herbicide application, methods of application, and measures to keep the public out of application areas. Please see **Master Response 10 - Mitigation Measure 5.1-1(a)** for a discussion refinements to BMPs in the VBMP to address the need for compensatory mitigation where potential impacts on sensitive natural resources cannot be avoided and recommendations for seasonal restrictions. The treatment program recommended as a refinement to **BMP-General-2** in Mitigation Measure 5.1-3(b) would ensure careful controls are fully implemented and conditions adequately monitored any time a management activity is to be performed within the 100-foot buffer of a wetland or riparian areas, as called for in **BMP-Sensitive Natural Resources-1**.

Response to Comment 11-16

The commentor requests additional information on fire fuel management impacts, and their effects on vegetation and habitat. The Draft TPEIR provides an appropriate level of detail about potential impacts at the programmatic level for the VBMP. The requested higher level of detail can only be provided during the subsequent environmental review for specific projects when information on location and presence or absence of any sensitive natural resources are known. See Response to Comment 11-11 and **Master Response 10 - Mitigation Measure 5.1-1(a)** for a discussion of potential impacts on wildlife habitat and refinements to BMPs in the draft VBMP to address the need for compensatory mitigation where potential impacts on sensitive natural resources cannot be avoided.

Response to Comment 11-17

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion on the herbicide use decision-making process for the District and the herbicide-free approach.

Response to Comment 11-18

The scientific basis for the risk screening analysis used derived from the USEPA document "The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments". The risk score concept like the one utilized in the Draft TPEIR has been peer reviewed and utilized by others. For example the Windows Pesticide Screening Tool (WIN-PST), developed by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), incorporates relative toxicity ratings in addition to relative exposure ratings to estimate screening-level risk ratings.

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion on the herbicide use decision-making process for the District. Also, please see **Master Response 7 - Hydrology and Water Quality** regarding revisions to that mitigation measure.

Response to Comment 11-19

Comment noted. Please see **Master Response 7 - Hydrology and Water Quality**.

Response to Comment 11-20

This comment is on the merits of the draft VBMP, and not the adequacy of the Draft TPEIR. The commentor asks why the draft VBMP emphasizes fuel breaks over defensible space. **Section 5.4 Hazards - Fire Hazards** of the Draft TPEIR does not address the efficacy of different types of fuel breaks, but rather analyzes the impacts from the implementation of the VBMP on the risk of fire hazard. Specifically, the TPEIR addresses whether the VBMP would impair or interfere with emergency or evacuation plans, expose people or structures to increased risks from wildland fires, result in the need for new fire protection facilities, or result in inadequate emergency access.[81]

In the draft VBMP, the MCOSD is not emphasizing wide-area fuel breaks. Rather, the draft VBMP considers them in a suite of fuel reduction and fire risk reduction strategies that aim to assist in the protection of homes and life in the wildland-urban interface. It is also the goal of the draft VBMP to minimize negative impacts to ecological integrity and species within the open space preserve system. Fuel breaks are areas where the vegetation cover and density is reduced in order to allow firefighting personnel quick access to construct a fire line (line of no vegetation) ahead of a fire's approach. In managing the fuel breaks within open space preserves, the MCOSD has focused on removing nonnative invasive broom species that grow densely in the understory of woodlands. Removing this dense buildup reduces fuel loads, removes ladder fuels, and reduces or eliminates an invasive species. The native tree canopy is left intact.

Much has been learned from fire ecology research in the last 30 years. However, there is no consensus among fire scientists that smaller areas of defensible space are more effective in preventing fires than wide-area fuel breaks. The purpose of fuels reduction zones (whether defensible space around homes or fuel breaks within wildlands) are to lessen the potential for fires and fire severity (hazard) and the impacts to homes and lives (risk). Many factors can influence the potential impact of wildland fires, including: 1) vegetation type and condition 2) current weather conditions (temperature, humidity, wind direction and speed), 3) terrain slope and aspect, 4) the degree to which buildings have been fireproofed, 5) whether these structures

[81] See Hazards - Fire Hazards - Significance Criteria on page 221 of the Draft TPEIR.

are actively defended by firefighters, 6) evacuation routes and plans, and 7) firefighting resources at hand. Maintaining defensible space next to wildlands is a California law (PRC 1491) that only applies to private lands. Marin County Fire Department follows the policy of the California Department of Forestry and Fire Protection (CalFire) and is responsible for enforcing the defensible space requirements.

Under the CalFire policy, all wildland fires must be extinguished as quickly as possible using as many resources as can be made available. Some of the studies indicate that a maintained fuel break may reduce fire severity and spread rates. However, fuel breaks are not designed to stop fires on their own. Rather, they provide a safe location from which firefighters can fight a fire.

There is documented evidence that fuel breaks adversely affect vegetation, wildlife, physical processes, and ecological health. These mostly negative impacts must be weighed against the value of the fuel breaks at providing protection from wildland fires. **Section 5.1 Biological Resources** of the Draft TPEIR discusses the potential impacts from the construction and maintenance of fuel breaks to special status species, sensitive natural communities, wetlands and other waters, and wildlife habitat and movement opportunities. **Section 5.1** concludes that with implementation of the best management practices detailed in the draft VBMP along with the mitigation measures required by the TPEIR, impacts to these biological resources would be reduced to a less-than-significant level.

Response to Comment 11-21

On page 206 of the Draft TPEIR (under the Flame Lengths section) it is stated that the highest flames lengths are predicted in areas of chaparral. It then lists some open space preserves that contain chaparral. This means that only in chaparral would flame lengths be highest, not in the entire open space preserve. For example, the Gary Giacomini open space preserve is mostly redwood and Douglas-fir forests, but there are minor but significant portions of chaparral.

It is true that the fire regime type for a typical coast redwood dominated forest would be a slow moving, low severity fire that moved along the forest floor, periodically moving up the trunks of some trees, maybe even occasionally getting into and scorching the top of the canopy. However, species are often grouped into fuel models that describe the expected behavior of fire within that type of fuel. Redwood trees are lumped with other conifers such as Douglas-fir into fuel model 10. [82] This fuel model describes fire behavior as burning the ground fuels with greater fire intensity than other timber litter models because there are many medium to large dead and down fuels that create a large amount of ground fuels. This is expected to lead to more frequent torching of individual trees (canopy is burned) with subsequent ember production and dispersal to other areas. Fire in the canopy with ember transport downwind can make fire control extremely difficult. As described by Anderson, [83] this fuel model is probably best suited for a Douglas-fir dominated forest that has large buildup of dead and downed trees and that is not influenced by coastal fog and higher humidity for much of the year. Unfortunately there is not a fuel model in the system used [84] that accurately reflects the fuel conditions and potential fire behavior of a coastal redwood forest. Fuel model 10 is the best approximation.

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82 "*Aids to determining fuel models for estimating fire behavior*." *The Bark Beetles, Fuels, and Fire Bibliography*, Anderson, H. E., 1982: 143.

83 "*Aids to determining fuel models for estimating fire behavior*." *The Bark Beetles, Fuels, and Fire Bibliography*, Anderson, H. E., 1982: 143

84 "*Aids to determining fuel models for estimating fire behavior*." *The Bark Beetles, Fuels, and Fire Bibliography*, Anderson, H. E., 1982: 143

In reality, many or most of the redwood dominated stands in the open space preserve system could have less dead and down fuels on the forest floor than fuel model 10 describes and have a moister environment due to fog and higher humidity, and thus fire behavior would be less severe than predicted by the fuel model. Fuel model designation is only used as a landscape scale (large area) assessment tool. Refinements of expected fire behavior can and are being conducted to better determine potential fire behavior at the local (small) scale.

It is also true that sites, such as around Novato, would be drier for much of the year compared to northern facing slopes nearer the coast with redwood forest stands. During the fire season, weather and predicted fuel moistures are used to determine potential fire behavior rather than just referring to the assigned fuel model. This assessment would find differences in the expected fire behavior in a redwood forest near the coast compared to a hardwood woodland further inland.

Based on the above the text in the second paragraph under **Exhibit 5.4-5** on page 206 of the Draft TPEIR is revised as follows:

> As shown on Exhibit 5.4-4, predicted flame lengths for most of the MCOSD preserves would be four to 11 feet in length; however, a significant portion would be expected to produce flame lengths that would challenge direct fire suppression (i.e., greater than four feet). This includes grassy areas in which heavy fuels are not a concern, but also shrubby fuels where line construction would not be easy. ~~The highest flame lengths are predicted in areas of chaparral, along Blithedale Summit, Baltimore Canyon, Gary Giacomini, and the cluster of preserves located near Novato: Lucas Valley, Pacheco Valle, Indian Valley, and Loma Verde.~~ <u>The highest predicted flame lengths are in areas of chaparral vegetation. This vegetation type occurs in significant quantity within Blithedale Summit, Baltimore Canyon, Cascade Canyon, Gary Giacomini, White Hill, Lucas Valley, and Ignacio Valley open space preserves. Smaller pockets of this vegetation type exist in some of the other preserves.</u> Weather conditions were the same used for the CAL FIRE analysis for the statewide mapping of fire hazard for the determination of Very High Fire Hazard Severity Zones. This is generally described as the “average worst” weather conditions, which are described in the previous page.

Response to Comment 11-22

The commentor is correct that the impact analysis in **Section 5.4 Hazards – Fire Hazards** only considers fire hazards to humans and structures and does not consider potential impacts to species, habitats, and processes. The issue that is raised in this comment is fully addressed in **Section 5.1 Biological Resources** of the TPEIR. The Fire Hazards section analyzes whether the proposed fuels management actions are consistent with and do not interfere with accepted countywide fire protection and response plans, does not create more fire hazards to humans and structures, does not expose people and structures to increased risk from fire, and does not result in inadequate emergency access. The potential impacts of actions to address fire hazards and risks to species, habitats, and processes are addressed in **Section 5.1 Biological Resources**. In that section, the report does find that fuels reduction actions could have a negative impact to species and habitats. Accordingly, the draft VBMP has developed best management practices that attempt to reduce the negative impacts that fuels reduction and fire risk reduction strategies and actions have to species, habitats, and processes.

Section 5.1 Biological Resources of the Draft TPEIR, evaluates impacts from the implementation of VBMP management activities to special status species, sensitive natural communities, wetlands and other waters, and wildlife habitat and movement opportunities.

Section 5.1 concludes that with implementation of the BMPs detailed in the draft VBMP along with the mitigation measures required by the TPEIR, impacts to these biological resources would be reduced to a less-than-significant level.

Response to Comment 11-23

Section 5.4 Hazards - Fire Hazards does not address the role of fire as a natural disturbance and the TPEIR analyzes whether implementation of the VBMP would impair or interfere with emergency or evacuation plans, expose people or structures to increased risks from wildland fires, result in the need for new fire protection facilities, or result in inadequate emergency access (see significance criteria on page 221 of the Draft TPEIR) and thus result in a significant impact. No part of the VBMP discusses the role of fire as a natural disturbance or process.

The MCOSD is aware that fire has historically occurred in all vegetation and habitat types across Marin County and the region. While most species do not require fire to exist, there are some plant species that only reproduce or reproduce well when a fire occurs. Some wildlife species also benefit from recent fires and the open habitat this disturbance creates. Having a patchwork of fire affected stands that are in different stages of post-fire recovery maintains a larger diversity of habitat types that could benefit overall native biodiversity. However, when considering the presence of nonnative invasive plants species that can quickly colonize a newly burned area, the results of fires to native species and habitats can be highly variable and not always positive.

Fire has been and will continue to be used as a management tool to re-introduce fire as a natural disturbance, to assist native species, and to control nonnative species. However, this can be accomplished only under managed prescribed burns. Even with prescribed fires, risks to humans and structure are substantial, making this option increasingly difficult to use. In addition, current statewide fire suppression policy does not permit unplanned wildland fires to burn for resource benefit. All unplanned fires, regardless of ignition source, will be suppressed as quickly as possible according to CalFire and Marin County Fire Department policies.

Response to Comment 11-24

This comment is on the merits of the draft VBMP, and not the adequacy of the Draft TPEIR. The purpose of the TPEIR is not to address issues such as the proximity of fire stations to open space preserves and that relationship to fuel reduction needs. The proximity of fire stations to wildlands currently does not factor into the decisions of where and how to construct and maintain fuel breaks, fuel reduction zones, and emergency access routes. It may be correct to assume that the proximity of fire stations to wildlands may influence the outcome of fire suppression activities. However, many more factors including weather, topography, vegetation type and condition, and access also influence fire behavior and the outcome of fire suppression activities. Reducing fuels in the defensible space zone and within fuel breaks is intended to slow a fire and reduce its severity, allowing firefighting resources more time to successfully fight the fire. Proximity of fire stations to open space preserves and the fire location may not play a role in fire suppression outcomes.

Response to Comment 11-25

The commentor describes a grammatical error in the Draft TPEIR. Based on this comment the first sentence in paragraph five on page 224 of the Draft TPEIR is revised as follows:

Regarding maintenance and construction of old and new fuelbreaks, a comprehensive set of environmental, firefighting effectiveness, and budgetary factors would be considered.

Response to Comment 11-26

This comment is on the merits of the draft VBMP, and not the adequacy of the Draft TPEIR. The TPEIR analyzes whether implementation of the VBMP would impair or interfere with emergency or evacuation plans, expose people or structures to increased risks from wildland fires, result in the need for new fire protection facilities, or result in inadequate emergency access (see significance criteria on page 221 of the Draft TPEIR) and thus cause a significant impact.

The MCOSD is aware that simply cutting broom at most times during its annual growth cycle will only result in vigorous re-sprouting and that the management of broom requires thorough consideration of treatment methods and timing. However, the VBMP is a scientific based comprehensive plan for managing vegetation on the open space preserves and does not identify specific treatment projects or methods. It does include a requirement that the MCOSD use an integrated pest management (IPM) approach to address invasive plants. The VBMP defines IPM as "a long-term, science-based, decision-making system that uses a specific methodology to manage damage from pests, including invasive plants."

Response to Comment 11-27

This comment is on the merits of the draft VBMP, and not the adequacy of the Draft TPEIR. **Section 5.4 Hazards – Fire Hazards** does not address the maintenance of defensible space by private landowners, but rather analyzes whether implementation of the VBMP would impair or interfere with emergency or evacuation plans, expose people or structures to increased risks from wildland fires, result in the need for new fire protection facilities, or result in inadequate emergency access (see significance criteria on page 221 of the Draft TPEIR) and thus have a significant impact.

California Public Resource Code 4291 requires all private landowners who live adjacent to wildlands (such as the open space preserves) to maintain defensible space within 100 feet of all habitable structures. It is the responsibility of the local fire departments to enforce this law and educate existing and new homeowners to comply with this law.

Response to Comment 11-28

This comment is on the merits of the draft VBMP, and not the adequacy of the Draft TPEIR. The factors in **Table 4.9** (Fuelbreak *Decision-Making Matrix*) of the Draft VBMP are important variables to examine when deciding whether to create, keep, or remove a fuel break. All variables, whether they had a positive impact or negative one, are assigned a non-negative number. The potential impacts to rare, threatened, or endangered species (this could include a number of species that have federal, state, or other status designations) are one of the variables to examine. If impacts to these species are high, then the project would score low (1 x 3 = 3). If impacts to these species were considered to be moderate, it would get a score of 21 (7 x 3), and if the expected impacts were considered to be low or none, then the score would be 30 (10 x 3). The lower the score for this variable indicates a greater potential for harm to these listed or special status species.

The variables in **Table 4.9** are not currently ranked, but a range of values are listed for potential rank scores. These scores are not fixed and different values between the highest and lowest value may be assigned. It is correct to assume that should a fuel break project potentially affect a listed species, it would score low for this environmental factor (a score of 3 (1 x 3)). This would lower its overall score. Removal or alternation of important native habitat that is home to a listed or special status species would also be considered under this same factor. In addition, any actions to construct or maintain fuel breaks would have to consider the potential impacts to federal or state listed species as required by the California and federal Endangered Species Acts and their recovery plans (see **Section 5.1 Biological Resources** of the TPEIR for further discussion on the potential impacts to species and habitats).

For the factor of enhancement to defensible spaces, this addresses fuel breaks that are or would be located on the perimeters of open space preserves. Since California Public Resource Code 4291 only applies to private lands, creating additional defensible space on public lands where the required 100 foot space cannot be met within the private parcel would enhance or compliment this defensible space. In addition, when other factors such as terrain and vegetation type warrant, more defensible space on public lands that goes beyond the 100 foot required zone may be added if impacts to habitats and species is acceptably low.

Response to Comment 11-29

The VBMP is a science-based comprehensive plan necessary to guide the MCOSD in its decision making for vegetation management projects. It is not a prescriptive plan that identifies specific projects or treatment methods. Therefore, there is no list of proposed fuel breaks.

Table 5.1 (*List of Potential Project to be Implemented*) in the draft VBMP identifies potential projects, which are not necessarily being proposed at this time. Any new fuel breaks would have to be thoroughly evaluated for need and potential impacts and would comply with CEQA prior to any work.

The potential projects identified in **Table 5.1** of the draft VBMP include fuel breaks adjacent to the communities of Mill Valley, Ross, and Larkspur. There are currently many fuel breaks in these preserves since many of the neighborhoods were developed with inadequate road systems that make emergency evacuation and firefighter access difficult. Fire departments serving these areas have wanted these fuel breaks near the communities they service to aid in wildland fire control.

The MCOSD agrees that maintaining fuel breaks is a costly endeavor, both financially and ecologically. However, the cost of implementing the VBMP is a policy matter for the Board of Directors to consider when it approves the plan and subsequent budgets that include vegetation management activities. The financial burden on the MCOSD is not an issue that CEQA requires consideration of in an EIR.

Response to Comment 11-30

The commentor raises a concern regarding Mitigation Measure 5.4-2. This mitigation requires the MCOSD to write a preserve system wildfire protection plan in cooperation with local fire agencies. The planning process would also include public involvement and compliances with CEQA.

The commenter is correct in pointing out that operations to construct and maintain fuel breaks and other fire hazard reduction work could exacerbate the spread of sudden oak death (SOD), caused by the pathogen Phytophthora ramorum. The VBMP includes BMP-Fuel Management-9 that addresses the spread of SOD. This BMP requires conformance with state and federal laws and regulations governing SOD and identifies procedures to contain the spread of SOD. This

BMP requires the MCOSD to locate staging, parking, and work areas away from infected trees, inspect all equipment, vehicles, and individuals upon leaving project areas for soil, leaves, twigs, and branches. With these measures, the VBMP will not result in significant impacts to the spread of SOD or other forest pathogens.

Response to Comment 11-31

See Response to Comments 4-85 and 4-89.

Response to Comment 11-32

See Response to Comment 11-17.

Response to Comment 11-33

Please refer to **Master Response 2 – Use of Glyphosate**. The environmental fate of herbicides varies depending on the manner in which it is applied, what it is applied to, when it is applied, and a variety of environmental factors such as temperature, humidity, and sunlight intensity. The fate of herbicides can range from minutes to months. The fate characteristics of a specific herbicide and the management of risk as a result of exposure to individuals that may come in contact with the herbicide is mitigated with language on the product label addressing reentry interval (REI). The REI specifies the amount of time that must elapse between herbicide application and re-entry into the treated area in order to substantially reduce or eliminate risk. The REI is posted on signs before, during and after application. Please refer to **Master Response 5 – Herbicide Use** for a discussion on postings, signage, and exposure to foliar herbicide residues.

Response to Comment 11-34

Risk is a combination of exposure and toxicity. Because the MCOSD implements numerous BMPs during the use of herbicides, human exposure to herbicides is unlikely to occur. Because of this lack of exposure, risk to humans from the use of herbicides is virtually eliminated. Please see **Master Response 5 - Herbicide Use** and Response to Comments 4-47, 4-87, and 7-18.

Response to Comment 11-35

First, DDT is an insecticide, not an herbicide and DDT's use was banned in 1972. Herbicides are designed to assist vegetation managers in the control of vegetation and are often plant- and scenario-specific. Please see **Master Response 2 - Use of Glyphosate** and **Master Response 5 - Herbicide Use**.

Response to Comment 11-36

See response to Comment 11-34. Please see **Master Response 5 - Herbicide Use** for a discussion on herbicide regulations, risk, and safety.

The commentor asks what review and assurances are in place that treatment programs called for in Mitigation Measure BIO-5.1-1(a) would be followed and serve to effectively mitigate impacts. See **Master Response 10 - Mitigation Measure BIO-5.1-1(a)**. Monitoring is only one part of a detailed mitigation measure that addresses vegetation management activities near sensitive natural resources. When taken as a whole, the measure provides adequate mitigation for potential impacts considering the VBMP is a management plan and the Draft TPEIR a programmatic document. Any subsequent CEQA review for specific projects would address potential impacts on sensitive natural resources and would identify any additional mitigation measures, if necessary.

Response to Comment 11-37

Impacts to sensitive natural resources are mitigated several ways, including the preparation and use of a treatment program as required by Mitigation Measure 5.1-1. The treatment program will take into account a variety of factors, including, but not limited to plant growth cycles, soil type, ground slope, nesting season, tide, etc.

Please see **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality. Refer to **Master Response 3 – Alternatives to Herbicide Use** for a description of alternatives, Integrated Pest Management, the herbicide use decision-making process for the District. Signage and postings are discussed in **Master Response 5 – Herbicide Use**.

Response to Comment 11-38

Rope wick and foliar applications are typically efficacious for a variety of plants. Rope wick application techniques can be a form of foliar application for which highly targeted applications are needed. Foliar applications are applied to the foliage of plants. No one plant is necessarily more amenable than another to either of these application techniques. Factors including size and age of the plant, season, number of plants treated and proximity to sensitive nature resources are among the factors that are considered when making a decision on the method of application. Other methods of treatment include basal bark injection and cut stump. The use of these techniques are typically appropriate for woody plant species.

Response to Comment 11-39

The commentor states that the alternatives are strained, complicated and difficult to understand.

As discussed in **Master Response 3 – Alternatives to Herbicide Use** the primary purpose of the VBMP is to provide a comprehensive, long-term plan for vegetation management. Its objectives are to:

- *Guide a science-based approach to vegetation management that will protect the natural biodiversity of the preserves, maintain public access, and manage fuel loads.*
- *Coordinate all aspects of vegetation management, including invasive plant control, needs for access, and fuel management, across all the MCOSD preserves, to improve program effectiveness and efficiency.*
- *Provide the foundation for a systematic approach to priority setting, budgeting, and staffing, to further improve program efficiency and effectiveness over the long term.*[85]

In other words, the purpose of the VBMP is to create a strategic system for implementing the MCOSD's vegetation management program. Without the plan, the District would not have any system for setting priorities, improving effectiveness, or efficiently operating the program. Currently, priorities are set by political, public, or other pressures that do not necessarily focus the vegetation management program on the highest priority or on the most effective action. The

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85 *Vegetation and Biodiversity Management Plan,* Marin County Parks, Marin County Open Space District, April 2015 Draft, page 1-5.

VBMP is the MCOSD's process to provide a strategic structure for the implementation of its vegetation management program.

Other than requiring the use of an integrated pest management (IPM) approach, the draft VBMP does not direct the implementation of various vegetation management projects. IPM is a science-based decision-making system that uses a specific methodology to manage damage from pests, including invasive plants. The goal of the IPM is to use the most effective and least environmentally harmful options to manage invasive plants.

Pursuant to CEQA, an EIR should include reasonable alternatives to the project that would feasibly attain most of the basic objectives of the project (*State CEQA Guidelines*, Section 15126.6(a)). Additionally, the *State CEQA Guidelines* does not require consideration of every conceivable alternative (*State CEQA Guidelines*, Section 15126.6(a)). The MCOSD relied on the "Rule of Reason" in selecting the alternatives for consideration in the EIR:

> The range of alternatives required in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision making (*State CEQA Guidelines*, Section 15126.6 (f)).

The VBMP is a comprehensive strategic plan aimed at improving the effectiveness and efficiency of the MCOSD's vegetation management program. As required by CEQA the Draft TPEIR considers a "No Project" alternative (*Alternative 1 - No Project Alternative*) plus two "build" alternatives - *Alternative 2 - Minimal Management* and *Alternative 3 - Risk Reduction*. These alternatives meet CEQA's "rule of reason" regarding the range of alternatives.

CEQA provides that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. Furthermore, CEQA requires that the lead agency (in this case the MCOSD) adopt mitigation measures or alternatives, where feasible,[86] to substantially lessen or avoid significant environmental impacts that would otherwise occur. Project modification or alternatives are not required, however, where such changes are infeasible or where the responsibility for modifying the project lies with some other agency. It is the opinion of the TPEIR authors that each of the mitigation measures presented in the TPEIR is feasible.

With the implementation of the mitigation measures included in the Draft TPEIR each of the identified significant impacts would be reduced to a less-than-significant level. With the implementation of the mitigation measures implementation of the VBMP, the proposed project, *Alternative 2*, or *Alternative 3*) would result in no significant unavoidable environmental impacts. Therefore, the range of alternatives presented in the Draft TPEIR is adequate.

[86] The *State CEQA Guidelines* (section 15364) define "feasible" as capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors,

To assist readers in a better understanding of the alternatives presented in the Draft TPEIR an further description of the alternatives is provided below.

Alternative 1 - No Project Alternative

The No Project Alternative describes vegetation management as the MCOSD conducts it today as a basis for comparison to the other alternatives. Work would continue with no change, at the same staffing and funding levels without a strategic systematic approach. The primary emphasis would be on (1) maintenance of the existing fuel break and fire management infrastructure; (2) controlling invasive non-native plants along roads and trails through mowing; and (3) managing for natural resources as grant funding is available, and managing for invasive plants located away from roads and trails on an ad hoc basis. Proactive vegetation management actions such as detection of new invasive plant infestations, mapping sensitive natural resources, or establishing defensible space zones would be undertaken opportunistically, as funding and staffing is available.

General Funding Levels

Funding would remain at current levels, which break down as follows:

- 63 percent - Maintenance/Management of Fuel Breaks and Fire Access Roads
- 22 percent - Natural Resource Management
- 7 percent - New Fuel Management Fire Risk Reduction
- 6 percent - Volunteer Program Activities
- 0.4 percent - Project Planning and Prioritization
- 1.6 percent - Equipment Purchases

Alternative 2 - Minimal Management

This alternative would make no changes to the budget or staffing of the vegetation management program, but would initiate a more systematic approach to vegetation management. The MCOSD would improve its vegetation management procedures by selecting and implementing projects in order to maximize results, resulting in a long-term reduction in ongoing maintenance needs, and related reduction in maintenance costs over time. The MCOSD would apply savings from reduced maintenance to natural resources activities. Under this alternative, the MCOSD would modify its vegetation management activities to maximize results. New practices would follow preserve-wide best management practices described in this plan. Use of better vegetation management practices and improved prioritization of activities and projects would produce better results (i.e. more acres of invasive plants treated/controlled; more fire management areas treated and requiring less follow-up maintenance, more efficient protection of sensitive natural resources as compared to the status quo).

General Funding Levels

Funding would remain at current levels, with emphasis shifting slightly towards fire risk reduction and natural resource management. General reduction in maintenance costs will result from improved methods and reduction in future facilities requiring maintenance, and may offset the increases in fire risk reduction and natural resource management. General cost breakdowns are as follows:

- 55 percent - Maintenance/Management of Fuel Breaks and Fire Access Roads (reduction of approximately 8 percent from current expenditures)
- 25 percent - Natural Resource Management (increase of 3% over current expenditures)
- 12 percent - New Fuel Management Fire Risk Reduction (increase of 5 percent over current expenditures)
- 6 percent - Volunteer Program Activities (same as current expenditures)
- 0.4 percent - Project Prioritization (same as current expenditures)
- 1.6 percent - Equipment Purchases (same as current expenditures)

Alternative 3 - Risk Reduction

This alternative would create a more systematic approach to vegetation management program that emphasize projects that can achieve both the reduction of fire risk and invasive plant expansions. Initially, the program budget and staffing levels would grow to (1) promote defensible space zones, (2) implement priority invasive plant control projects, and (3) improve overall fuels management in high-fire risk areas. The focus would be on selecting vegetation management actions that both reduce fire risk and invasive plant expansion. Under this concept, the District would modify and standardize its fuel management strategies to support both public safety and biological diversity.

General Funding Levels

Alternative 3 would initially require a 25 to 40 percent increase in expenditures, but would drop down to an increase of 10 to 25 percent as invasive plants are successfully controlled and eliminated. Increased costs would be partially offset by general reduction in maintenance costs over time as a result of improved methods and reduction in future facilities requiring maintenance. General cost breakdowns as follows:

- 40 percent - Maintenance/Management of Fuel Breaks and Fire Access Roads (reduction of approximately 23 percent from current expenditures),
- 32 percent - Natural Resource Management (increase of 10% over current expenditures),
- 18 percent - New Fuel Management Fire Risk Reduction (increase of 11% over current expenditures),
- 8 percent - Volunteer Program Activities (increase of 2% over current expenditures),
- 0.4 percent - Project Prioritization (same as current expenditures), and
- 1.6 percent - Equipment Purchases (same as current expenditures).

To assist in a comparison of the alternatives to the draft VBMP, below is a description of the proposed project in the same format as the description of the alternative above.

Proposed Project

The proposed project would change the current vegetation management program to emphasize the long-term longevity and stability of natural resources within the open space preserves. Under this concept, the District would seek to improve the condition of natural resources on its preserves, thereby resulting in increased numbers and distribution of special-status, locally rare, and sensitive species, and native plant communities. Fire risk management would continue to be a priority, and vegetation management would emphasize the reduction of fire risks posed by climate change and related vegetation type conversion and fuels buildup on MCOSD lands.

The MCOSD would assess fuel breaks and other infrastructure within the interior of preserves against natural resource values, and where appropriate reduce, remove, or relocate these facilities to increase habitat connectivity. The District would map and monitor special status species populations, while undertaking high priority restoration activities to remove threats, sustain the viability of these populations, and expand ranges to priority areas within the preserves. The proposed project would require the MCOSD to focus on particular invasive non-native plants and other threats in areas where special status, sensitive, and high value habitat corridors exist. The early detection of new infestations would be a priority within all sensitive habitats. The proposed project would also focus on the eradication of new infestations wherever possible and the reduction of existing infestations over time (containment leading to sustained control as staff and funding become available).

Fuel management strategies would be multi-faceted and standardized to support both public safety and biological diversity. The primary emphasis would be on having primary fuel breaks installed and maintained in such a way that they do not negatively affect sensitive vegetation. The MCOSD would work collaboratively with residents and fire agencies to facilitate increased community responsibility for creating and sustaining defensible space zones on private lands, and would establish wide-area fuel breaks.

Under this concept, the focus would be on managing the diversity, richness, complexity, and connectivity of vegetation resources on MCOSD lands for resiliency and longevity. The approach is similar to *Alternative 3*, but in addition actively seeks to increase the distribution of special-status species, locally rare and sensitive species, and native plant communities. Vegetation management actions would focus on managing for changing ecological systems and environments, increasing habitat resiliency in response to climate change, and increase habitat connectivity to provide for sustainable wildlife areas. The MCOSD would implement management and restoration activities on a larger-scale than in *Alternative 2 - Minimal Management* or Alternative 3 - Risk Reduction.

General Funding Levels

There would be a substantial increase in funding over current levels for the natural resource management and volunteer programs. Budget increases anticipated to initially require an approximately 50 to 75 percent budget increase in the short term to fund additional fire management and invasive plant control work. After this initial work, the budget would decrease back to approximately 25 to 40 percent above current budgetary levels. The MCOSD would reallocate a portion of funds currently in the maintenance budget to address the early detection and treatment of invasive plants. The proposed budget would also allow the MCOSD to reallocate funds by improving cost efficiencies, balancing fire risk management with natural resource management, and reducing maintenance costs over time.

- 30 percent - Maintenance/Management of Fuel Breaks and Fire Access Roads (reduction of approximately 33 percent from current expenditures),
- 40 percent - Natural Resource Management (increase of 18% over current expenditures),
- 18 percent - New Fuel Management DSZ Fire Risk Reduction (increase of 11% over current expenditures),
- 10 percent - Volunteer Program Activities (increase of 4% over current expenditures),

- 0.4 percent - Project Prioritization (same as current expenditures), and
- 1.6 percent - Equipment Purchases (same as current expenditures).

Comment Letter 12

July 8, 2015

MARIN CONSERVATION LEAGUE
Protecting Marin Since 1934

James Raives
Senior Open Space Planner
Marin County Parks and Open Space District
3501 Civic Center Dr., Suite 260
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Subject: Vegetation and Biodiversity Management Plan and Draft Tiered Program Environmental Impact Report

Dear Mr. Raives:

The Marin Conservation League (MCL) has reviewed the Vegetation and Biodiversity Management Plan (VBMP, or Plan) and associated Draft TPEIR and wishes to submit general comments on the VBMP and TPEIR, as well as specific comments that relate to deficiencies in the Draft TPEIR. It is our understanding that the VBMP is labeled as a "Draft," but is unlikely to be revised. Since the Plan constitutes the "Project" and the subject of impact analysis, however, we believe our comments on the Plan are relevant to the "adequacy" of the Project Description and other sections in the TPEIR and should be incorporated as appropriate in the Final TPEIR.

MCL strongly supports the purpose and direction of the VBMP and Draft TPEIR

MCL strongly supports the purpose and direction of the Vegetation and Biodiversity Management Plan. The 34 open space preserves are a significant component of Marin County's natural heritage. They are under increasing threat from climate change, invasive plants, pathogens, wildfire, a historical legacy of misuse and neglect, ongoing disturbances caused by managing fuel to reduce risk of wildfire, and intensifying recreational uses. Additionally, a recent public initiative could inhibit the use of herbicides as a tool to combat the exponential growth of invasive plants on the preserves. We are pleased that for the first time in the history of the Open Space District, the VBMP provides the knowledge, procedures, and tools to address all of these threats. Notwithstanding the Plan's merits, MCL believes it could be strengthened through the Final TPEIR in several ways, as follows.

12-01

The VBMP and TPEIR should make a stronger case for the central importance of biodiversity. Protecting biodiversity, along with reducing wildfire risk, is the fundamental reason for preparing the Plan. The ecological elements that make up biodiversity on the preserves are summarized on pages 2-3 to 2-5 of the VBMP, and they are presented throughout the Plan in the many pages of tables of preserve conditions and sensitive species. A key paragraph that summarizes *why biodiversity is important to protect*, however, is buried at the end of page 2-5, beginning : "...areas of high biodiversity provide important ecological functions, such as food and shelter for wildlife, natural water purification and filtration, storage of carbon in living plant tissue and in soils, and other essential ecological functions..." And so on.

This paragraph should be brought forward into the Final TPEIR Summary of Findings. At present, the Draft TPEIR simply notes the three purposes listed in the Plan, namely maintaining

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12-01 (cont.)

biodiversity, maintaining emergency and public access, and managing fuel characteristics to reduce wildfire threat (Draft TPEIR p. 17; Plan p. 1-5). This bland statement assumes that the public understands and appreciates the importance of maintaining biodiversity as essential to all life forms, including human well-being, just as they understand the importance of preventing wildfire as critical to human safety. We don't think this is the case.

One purpose of the Plan and the TPEIR should be to educate the public about the importance of biodiversity generally and of the biodiversity of the preserves specifically. Since there is no intention to modify the Plan, this function should be handled in the TPEIR.

> **The Final TPEIR needs to contain a clear explanation of the values and functions of Marin's native plants and habitats and an explanation of what would be lost if they were allowed to degrade or disappear. This should include the value of these biota not only within their biological environment, but also in educating and inspiring the citizens of Marin as well as visitors from abroad.**

12-02

<u>The VBMP and TPEIR should demonstrate a stronger connection with the Road and Trail Management Plan</u>. The VBMP lays the groundwork for the RTMP in zoning vegetation according to rarity and sensitivity to disturbance, presumably to guide the designation and potential future development of roads and trails away from the most sensitive "Legacy" and "Sustainable Natural Systems" zones. Missing from the Plan, however, is a section that relates recreational use to specific requirements for vegetation management. The VBMP, Chapter 3, Assessment of Regional Trends... (p. 3-9), emphasizes the importance of tying resource protection and restoration actions to visitor access improvements, especially given the strong link between trails and invasive plant infestations and continued public pressure for more public access and more diverse types of visitor use. Other impacts to vegetation besides invasion of non-natives species can result from excessive recreational use, including habitat fragmentation, vegetation trampling, soil and duff compaction, and alteration of water regimes.

These links between recreational infrastructure and the need for both protection and management of vegetation are scattered throughout the Plan, but the TPEIR suggests that implementation of the RTMP and the VBMP will be independent of each other (See pp. 102 and 132).

> **The Final TPEIR should identify how the two Plans can and should work together with a common purpose of preserving natural resources, especially where projects overlap, e.g., a trail decommissioning or realignment, combined with a treatment program to eradicate invasive plants, followed by revegetation.**

12-03

<u>A clearer picture of the extent of non-native plant invasions in the preserves is needed</u>. CEQA requires a clear description of existing conditions to serve as an impact baseline. In Table 4, (Priority Invasive Plants and Acres Infested), and in Table 5.1 (Invasive Plant Projects), the TPEIR provides an extensive inventory of particular species of concern, the affected preserves, work that has been accomplished, and recommendations for ongoing or future work. Informative though it is, it does not describe the current extent of plant infestations, both as an estimated number of acres infested, and as a percentage of the overall preserve acreage under

12-03 (cont.)

management. (And it is unclear whether the acreages in Table 4 are cumulative or overlapping.) This information is necessary to convey the extent and severity of current plant infestations, and to facilitate an understanding of the impacts that would result if the No Project alternative were adopted. It will also be necessary in order to assess the success or otherwise of the Plan in achieving its goals. The data in these tables, and in Tables C.1 (Non-Native Plants in the Preserves), and C .2 (Priority Invasive Plants in the Preserves) are a start in the right direction.

> **In order to fully account for the impact of doing nothing (the No Project Alternative), and to establish a baseline for work to be undertaken in the Plan, the Final TPEIR should provide an overall quantification and a meaningful narrative, including acres infested, expected rate of expansion, and the exponential nature of plant invasions generally. This should replace the vague qualitative statements in Chapter 6 and Table 6.0-1.**[1]

12-04

<u>The List of Significance Criteria for impacts on biological resources should include "substantial" loss of ordinary native habitat acreage to fire, pathogens and plant invasions</u>. The focus of the Biological Resource Impacts listed at page 126 is exclusively on special status wildlife and high value habitats. This is unduly restrictive. The total quantity of native habitat in the preserves, regardless of its "quality," is itself an important value to be considered and protected. The TPEIR should acknowledge the significance of loss of native habitat to fire, pathogens or invasive plants, regardless of whether the habitat lost is of high value. This is necessary to clarify to decision-makers and members of the public that any limitations imposed on the management strategies proposed in the Plan could result in significant habitat loss and trigger necessary mitigation measures or consideration of alternatives. Section 15064(b) of the CEQA Guidelines and the cases interpreting it authorize lead agencies to adopt project-specific or plan-specific standards of significance.

> **The Final TPEIR should include an additional Significance Criterion for loss of native habitat as a likely significant impact of the No Project Alternative and possibly the Minimal Management Alternative. In addition, the Cumulative Impact discussion should consider the significance of cumulative loss due to the co-occurrence of more than one of the various threats to which the preserves are subject.**

12-05

<u>Impacts of fuel management activities on wildlife habitat and movement opportunities are not adequately mitigated in chaparral communities</u>. Impact 5.1-4 *Wildlife Habitat and Movement Opportunities* identifies activities associated with creating fuel breaks and defensible space as being disruptive to vegetation and wildlife habitat. These include thinning of trees, creating separations in canopy, and breaking up continuous vegetation. As mitigation, BMP-Fuel Management-13 has been augmented to include giving consideration to "...limiting excessive thinning or disruption of continuous canopy to native woodland and forest cover." Omitted from consideration are several vegetation alliances that, together, constitute "chaparral." Chaparral subtypes are present on many of the preserves, often in association with serpentine alliances. The

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[1]Another bit of information is unclear. Non-Native Forest and Scrub is described as a habitat type at p. 111, and 41.4 acres of eucalyptus are noted as existing on preserve lands at Exhibit 5.1-1 (p. 107). It is unclear if this acreage includes other plant species in the Non-Native Forest and Scrub category or only eucalyptus, and what the acreage of the other plants in this category is.

12-05 (cont.)

Draft TPEIR acknowledges that chaparral is a "sensitive natural community" (P. 114), and Table B.2 in the VBMP lists occurrences of "chaparral" alliances on many preserves, but considers them sensitive only in relation to the special status plant species they host. Chaparral plays a vital role as habitat for diverse wildlife. It is particularly rich in wildlife species along ecotones with other scrub communities, and woodland or forest. (Chaparral also is important as watershed cover, requiring little water for survival while effectively holding soil, dissipating the energy of rainfall, and regulating storm runoff.) Chaparral is also a typical target of fuel management activities, due to its flammability, and too often is viewed solely in those terms. The Draft TPEIR estimates that only 0.8 acres of mixed chaparral might be affected by fire fuel management activities. (p. 138) This seems to be an unrealistically low estimate, in view of its prevalence along ridgelines that are the target of fuel break planning.

> **The Final TPEIR should expand the description of the role played by chaparral alliances on the preserves as wildlife habitat, reassess the anticipated losses considering its vulnerability to fuel management, and should augment BMP-Fuel Management-13 to include giving consideration to avoiding excessive thinning and other reduction of this important vegetation cover type.**

12-06

<u>Consider adding an alternative for invasive plant management without glyphosate as a tool</u>. Since a limitation or prohibition on the use of glyphosate resulting from the recent IARC designation of glyphosate as a "probable carcinogen" is a possibility, and decision-makers and members of the public need to be informed about the consequences ("impacts") of such an action before it is given serious consideration, consider adding an alternative, or modifying an alternative to consider what the impacts of a limitation or prohibition of glyphosate use would be.

> **The Final TPEIR should evaluate a sub-alternative that excludes glyphosate from the IPM tools currently used by MCOSD to manage invasive plants. In addition, the Final TPEIR should expand the discussion in Appendix E and Chapter 5.5 Hazards and Herbicide Use to include the latest information on the IARC listing of glyphosate as a probable human carcinogen.**

12-07

<u>Additional mitigations for herbicide exposure should be considered</u>. Additional mitigation measures to protect preserve users from herbicide exposure should be considered in the Final TPEIR. Public meetings have shown strong public opposition to herbicide use in the preserves. The Draft TPEIR refers the reader to the BMPs in the Plan at page 7-20, Table 7.5. Of these, BMP-1 lists BMPs to address potential herbicide exposures to applicators and preserve users. These include posting the treatment site four days in advance of application, posting a map of the site showing the area to be treated, and removing the notification four days after application. See also TPEIR at p. 269.

> **In addition to these measures, the Final TPEIR should include the following mitigation measures: 1) Maintain the notification maps in place for at least six months following treatment; and 2) Post on the county parks' website for at least six months after application the locations that have been treated, including the site map and the treatment date.**

These additional measures would address users' concerns about post-application exposure to treated foliage and would provide preserve users with a reasonable certainty that they could avoid contact with herbicides.

12-08

The Mitigation Measures to protect preserve users from herbicide exposure to impacted waters are not well explained. In the TPEIR, Exhibit 2.0-1 (p. 21) presents a Summary of Impacts and Mitigation Measures. Impact 5.2-3 is Degraded Water Quality and Substantial Additional Sources of Polluted Runoff (p. 33-34). The explanation for this impact states that foliar spray application of herbicides, as analyzed in the risk assessment at Section 5.5, would result in significant impacts to "preserve user exposures" (sic) originating as either ingestion or dermal absorption. The listed mitigation measure is 5.2-1 (p.30), which incorporates Mitigation Measure 5.5.1 (p. 39). This includes two mitigation measures, both of which focus almost exclusively on protection of water quality and ecological receptors, not preserve users.

> **While the measures cited above may indirectly protect preserve users, the mechanism by which they would do so should be clearly explained in the Final TPEIR.**

12-09

Impact 5.5.2 in Exhibit 2.01 is Applicator and Preserve User Exposure to herbicides. It states that by following label requirements, Pest Control Advisor recommendations and BMPs in the Plan, the impacts would be less than significant, and no mitigation measures would be required. It doesn't state which BMPs apply or where to find them in the Plan. Presumably the BMPs referred to are those on p. 7-20 of the Plan, namely: BMP-1 (follow Integrated Pest Management (IPM) practices, i.e. use of licensed professionals and posting prior notification with a site map).

> **The Final TPEIR should identify clearly for readers which BMPs are applicable to avoid or minimize exposure of applicators and preserve users to herbicides, and where they can be found in both documents.**

12-10

Consider adding exposure of preserve visitors to herbicide as a major issue. Considerable public interest has been raised about herbicide use in the preserves. The analysis in the Draft TPEIR concludes that with implementation of the listed mitigation measures/BMPs, such use poses no significant impact in the form of exposing preserve visitors to herbicides (p. 269, Impact 5.5-2).

> **Based on the evaluation and mitigation measures and BMPs provided in the impact analysis, consider adding to the list of Major EIR Conclusions at p. 45 that exposure of public visitors in the preserves to herbicide use poses no significant impact.**

12- 11

Reference the Vegetation Management Programs and Policies of Other Leading Agencies. The TPEIR explains that one of the objectives of the Plan is to "work with adjacent public landowners and partner agencies to create a consistent approach to vegetation management issues; establish, prioritize, and standardize vegetation management actions." P.54. The VBMP devotes Chapter 3 to *Assessment of Regional Trends, Practices, and Science*, based on consultation with a dozen land management agencies and organizations. The Draft TPEIR fails to discuss the importance of these consultations, or reference documents that explain how other agencies are handling vegetation management issues. Reassuring readers that the approaches in the Plan and TPEIR are standard among leading agencies in the field of vegetation management, particularly the National Park

12-11 (cont.)

Service and State Parks, provides support for the management actions discussed in the Plan and Draft TPEIR.

> **Consider incorporating by reference some of the reports on vegetation management and herbicide use generated by the Marin Municipal Water District, particularly:**
>
> **1) Interim Background Report No 1: Non-chemical Weed Control Techniques (which explains why these techniques are generally not cost-effective).**
>
> **2) Interim Background Report No. 2: Chemical Weed Control Techniques (which support the cost-effectiveness of using herbicides).**
>
> **3) Final Report: Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration (which supports statements in the TPEIR regarding the non-persistence of glyphosate in soils).**

If you have questions, please address them to Nona Dennis or Paul Minault, c/o MCL. MCL appreciates the opportunity to comment and looks forward to reviewing the Final TPEIR and Response to Comments in coming months.

Sincerely yours,

Kate Powers

Kate Powers, President

RESPONSE TO COMMENT LETTER 12 - KATE POWERS, MARIN CONSERVATION LEAGUE, JULY 8, 2015

Response to Comment 12-1

The commentor strongly supports the purpose and direction of the VBMP, but believes it should make a stronger case for the central importance of biodiversity, and since it is unlikely that the draft VBMP is going to be revised, that the Draft TPEIR should be revised to reflect this importance. The purpose of the Draft TPEIR is to assess the potential impacts of the VBMP and present that information to the public and decision-makers, not clarify the purpose of the VBMP. The commentor is correct that an important purpose of the VBMP is to educate the public over the importance of maintaining and enhancing native biodiversity. These objectives are reflected in both Goal 1 that calls for working with adjacent public landowners and partner agencies and Goal 4 which calls for providing the public with opportunities to engage in stewardship of the MCOSD lands, as listed on page 1-8 of the draft VBMP.

Response to Comment 12-2

The commentor believes the VBMP and Draft TPEIR should demonstrate a stronger connection with MCOSD's *Road and Trail Management Plan*, and that a clearer description of the extent of non-native invasive species should be provided. The commentor is correct that visitor use activity can have a substantial adverse impact on local biodiversity and could result in damage and or loss of sensitive natural resources. However, they are generally not relevant to the vegetation management activities addressed under the VMBP. These issues were addressed as part of the *Road and Trails Management Plan*, and this comment is not related to the adequacy of the Draft TPEIR. As noted on pages 102 and 132 of the Draft TPEIR, the analysis of impacts and recommended mitigation measures in Chapter 5 of the Draft TPEIR are intended to address the implementation of the VBMP independent of the *Road and Trails Management Plan*.

The threats posed by non-native invasive species is a primary focus of the VBMP. This issue is discussed under **Prevent the Introduction and Spread of Invasive Species** on pages 4-35 and 4-36 in Chapter 4 of the draft VBMP. **Table 5.1** (*List of Potential Projects to be Implemented*) in the draft VBMP includes the “District-Wide Early Detection/Rapid Response Program Implementation” and “District-Wide Invasive Plant Rapid Assessment” as the two overarching invasive species control projects, together with target species and locational invasive species treatment programs. Additionally, a program for implementing a system-wide early detection of invasive plants and rapid response is discussed on pages 6-5 and 6-6 of the draft VBMP. **Table B.2** (*Vegetation Types Presented by Preserve*), contained in **Appendix B** of the draft VBMP, includes acreage estimates of some of the more widespread invasive species that have been mapped on various MCOSD preserves. These include French broom, Harding grass, teasel (*Dipsacus sativa*), pampas grass, and eucalyptus. This comment, however, is not related to the adequacy of the Draft TPEIR, which provides a detailed assessment of the potential impacts of implementing the VBMP, including direct and indirect effects of invasive species controls.

Response to Comment 12-3

The commentor believes that the Final TPEIR should provide an overall quantification and meaningful narrative, including acreages of non-native plant species infestations, their expected rate of expansion, and description of the exponential nature of plant invasions. This information would be crucial in demonstrating the real threats under the No Project Alternative. As discussed in Response to Comment 12-2, the threats that invasive species pose to native biodiversity and sensitive natural resources is well understood by MCOSD, and the draft VBMP provides considerable information and a framework for addressing this challenge. No additional analysis or revisions to the Draft TPEIR are necessary to demonstrate this known fact, or to assess the potential impacts of the VBMP in addressing the threats posed by infestations of invasive species.

Species included in the category of “Non-native Forest and Scrub” habitat types on page 111 and in **Exhibit 5.1-1** (page 107) in **Section 5.1 Biological Resources** of the Draft TPEIR include: eucalyptus, Monterey pine, Monterey cypress, Chilean mayten, acacia species, tree-of-heaven, and stands of broom, among others.

Response to Comment 12-4

The commentor believes that the significance criteria on page 126 of the Draft TPEIR should include an additional criterion regarding the “substantial” loss of ordinary native habitat. While the concerns of the commentor over the potential risks to native habitat are noted, the significance criteria used in the Draft TPEIR are based on the *State CEQA Guidelines* and the Marin County Environmental Impact Review Guidelines. This provides for a consistent set of criteria for evaluating the potentially significant impacts of proposed projects, consistent with local and state regulations.

The discussion under *Impact 5.1-4 Wildlife Habitat and Movement Opportunities* on pages 141 through 144 of the Draft TPEIR addresses the potential impacts of the draft VBMP on wildlife habitat and movement opportunities of concern to the commentor. However, the threats to native wildlife habitat as a result of fire, pathogens, and invasive species is an existing condition, not a potential impact of the VBMP itself, which is in large measure being proposed by MCOSD to address these threats and would serve to reduce or eliminate them in some locations when successfully implemented. No additional analysis or revision to the Draft TPEIR is necessary.

See Response to Comment 14-37 for a discussion of cumulative impacts on biological resources.

Response to Comment 12-5

The commentor believes that the edits to **BMP – Fuel Management-13** in Mitigation Measure 5.1-4(b) does not address chaparral habitat, which they believe would otherwise result in a significant impact on this natural community type. The defensible space fuel management calculations in **Exhibit 5.1-1** of the Draft TPEIR estimates that only about 0.8 acre of mixed chaparral would be affected with implementation of the VBMP. Compared to the estimated 704 acres of chaparral habitat mapped within MCOSD preserves, this is a small acreage of affected chaparral habitat. However, other fuel modification projects contemplated under the draft VBMP could disturb additional areas of chaparral cover.

The focus of the analysis contained in the Draft TPEIR and recommended modifications to **BMP – Fuel Management-13** was on potential impacts on woodland and forest habitat because of the higher acreage estimates that would be disturbed within the defensible space zones. However, in addition to consideration of native woodland and forest habitat, the revisions to **BMP-Fuel Management-13** recommended in Mitigation Measure 5.1-4(b) also call for consideration of sensitive natural community types and other areas encompassing sensitive natural resources to be made as part of any guidance involving substantial thinning and breaking up of continuous vegetation. This would include any chaparral alliance ranked as a sensitive natural community (see **Table B.1** (*Vegetation Types on Preserves*) in **Appendix B** of the draft VBMP), meaning that it would have already received consideration under the edits in Mitigation Measure 5.1-4(b). Given that the recommended revisions to the BMP already capture any alliances of chaparral that qualify as a sensitive natural community type and that the currently estimated acreages affected by treatment under the defensible space zone project represents a negligible portion of the total acreage of chaparral cover on MCOSD preserves, no additional revisions to **BMP-Fuel Management-13** or to the conclusion in the Draft TPEIR are considered necessary in response to the comment.

Response to Comment 12-6

Please see **Master Response 2 – Use of Glyphosate** for a discussion on the IARC's conclusions regarding glyphosate. Refer to **Master Response 3 – Alternatives to Herbicide Use** for a discussion on Integrated Pest Management and the herbicide-free alternative.

Response to Comment 12-7

Please refer to **Master Response 5 - Herbicide Use**. Signage will be posted consistent with the herbicide product label and the specified Reentry Interval (REI). Please see Response to Comment 11-33. The REI specifies the amount of time that must elapse between herbicide application and re-entry into the treated area in order to substantially reduce or eliminate risk.

Response to Comment 12-8

A portion of the text on pages 33 and 34 of the Draft TPEIR referenced in this comment is incorrect. As discussed in *Impact 5.5-2 Applicator and Preserve User Exposure* with the following of label requirements, PCA recommendations, and implementation of pertinent BMPs in the VBMP herbicide exposure to human receptors (applicator and preserve user) would be a less-than-significant impact.

Based on the above, the text beginning on page 33 of the Draft TPEIR is revised as follows:

> *5.2-3 Degraded Water Quality and Substantial Additional Sources of Polluted Runoff*.
>
> Implementation of the VBMP would include the foliar spray application of synthetic and organic herbicides, surfactants and dyes. **Section 5.5 Hazards - Herbicide Use** presents a semi-quantitative to qualitative risk screening analysis of ecotoxicity for selected plant, insect, and animal and receptors for a list of herbicides potentially approved for use by MCOSD. The results of that analysis indicate that foliar herbicide applications following concentration limits specified on the labels of assessed brand name products would result in significant impacts to aquatic-phase amphibians, fish, aquatic invertebrates, and terrestrial insects~~, and preserve user exposures, originating as either ingestion and/or dermal absorption~~. Given these assessed toxicities, and the potential for wet season herbicide applications within 100 feet of creeks, rivers, ponds, springs and seeps, surface runoff and/or degraded groundwater discharge, project implementation could result in substantial additional sources of polluted runoff reaching these sensitive water resources within the preserve areas.

Response to Comment 12-9

The commentor is correct. As discussed in the Draft TPEIR, the BMPs referred to are those on page 7-20 of the draft VBMP, namely: **BMP-Invasive Plant-1**.

BMP-Invasive-Plant-1 *Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures* states that the MCOSD shall use an IPM approach in regard to herbicide application an establish notification and signage procedures. It also states that, for all herbicide use, the MCOSD will implement the following procedures:

- All applications must be conducted under the recommendation of a certified Pest Control Advisor.
- All applications must be conducted by a professional qualified applicator.
- All applications must be posted with the current "Notice of Herbicide Application" four days in advance of the application at all main entry points.
- For all proposed treatment areas, application notices must be accompanied by a map of the site indicating the approved area to be sprayed.
- All Notices of Herbicide Application must be removed four days after the application has been made.

A sample of a typical Notice of Herbicide Application is provided in **Appendix E-5** of the Draft TPEIR.

For preserve users, the precautionary measures taken by the MCOSD to inform the public by providing notice at the entry to herbicide treatment sites (such as the notice of herbicide application warning signage) are considered sufficient to significantly reduce or prevent herbicide exposure to preserve users. Please see **Master Response 5 – Herbicide Use** for additional discussion on herbicide regulations and safety as well as postings and signage.

Response to Comment 12-10

See Response to Comment 12-07.

Response to Comment 12-11

Comment noted. It is indeed important for consultations to occur and for documents to be shared among agencies. **Exhibit 5.5-1** in the Draft TPEIR lists the relevant agencies and their associated documents. Consistency of approach among the vegetation management professionals at the relevant agencies is supplemented by the fact that these staff are typically degreed professionals with licenses and certifications who exercise professional judgment necessary to perform plant- season- and site-specific vegetation management.

Comment Letter 13

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July 8, 2015

Via Email and Regular Mail
James Raives,
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Re: Vegetation and Biodiversity Management Plan and Draft Tiered Programmatic Environmental Impact Report

Dear Mr. Raives:

I am writing on behalf of two local organizations, Community Venture Partners and Sustainable Tam/Almonte to comment upon the Marin County Parts, Open Space District's ("District") Vegetation and Biodiversity Management Plan ("Plan") and Draft Tiered Programmatic Environmental Impact Report ("DEIR").

I. INTRODUCTION

The Plan proposes to control invasive weeds and clear vegetation for fire safety through a variety of control methods. Our primary concern is the 'chemical' control option, which includes the broad based uses of a number of different herbicide products containing the active ingredients: glyphosate (in the form of AquaMaster, Rodeo, & Roundup Custom), fluazifop-p-butyl, sethoxydim (FusiladeII & Poast) , triclopyr (Garlon 4) and imazapyr (Habitat).

13-01 In our view, the DEIR does not address the potentially significant impacts of this project on the Marin environment, and thus fails as an informative document under the California Environmental Quality Act ("CEQA"), Pub. Res. Code § 21000 *et seq*. *See Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392. As discussed more fully below, the DEIR does not provide adequate information about either the amount or type of herbicide applications that will utilized, nor does the DEIR acknowledge the full scope of toxicity and contamination from herbicide use that could harm wildlife and plants, as well as human applicators and visitors to the District's parcels. We urge the District to take a closer look at these impacts, and to consider a non-herbicide first option as an action alternative in the DEIR.

II. COMMENTS ON DEIR

A. The DEIR Does Not Adequately Assess the Environmental Setting.

An EIR must adequately describe the environmental setting where the project is located. *San Joaquin Raptor v. County of Stanislaus* (1994) 27 Cal. App. 4th 713, 722-723.

Friends of the Eel v. Sonoma County Water Agency (2003) 108 Cal. App. 4th 859, states:

13-02

> An EIR must contain an accurate description of the project's environmental setting. An EIR "must include a description of the physical environmental conditions in the vicinity of the project ... from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." (Guidelines, § 15125, subd. (a).) There is good reason for this requirement: "Knowledge of the regional setting is critical to the assessment of environmental impacts. ... The EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated and discussed and it must permit the significant effects of the project to be considered in the full environmental context." (Guidelines, § 15125, subd. (c).) We interpret this Guideline broadly in order to "afford the fullest possible protection to the environment." (*Kings County Farm Bureau, supra,* 221 Cal. App. 3d 692, 720.) In so doing, we ensure that the EIR's analysis of significant effects, which is generated from this description of the environmental context, is as accurate as possible. (*See also* Remy et al., Guide to the Cal. Environmental Quality Act (CEQA) (10th ed. 1999) pp. 374-376.)

Id. at 874. Here, the DEIR does not meet this standard.

1. DEIR Fails to Describe Location of Invasive Weed Infestations in Marin.

The DEIR fails to provide the location of invasive weeds on the District lands, and the relation of those infestations to sensitive natural resources that are supposed to be protected., as listed in Table 2.1 of the Plan. (pp. 2-7 - 2-29). Instead, invasive weeds are just generally described, and no information is provided about the amount of area that would need to be protected according to the sensitive natural resource types identified by Table 2.1.

13-03

Without this information, there is no way for the public to gauge how often herbicides will have to be used within the 100 foot buffer zones adopted as a mitigation measure by the DEIR. Further, major weed infestations both within and without these sensitive zones could raise the possibility, not addressed by the DEIR, that it will not be feasible to use herbicides effectively without causing significant impacts to affected resources.

//

13-04

2. DEIR Fails to Describe Effectiveness of Herbicide Treatments.

The Plan discusses herbicide applications that occurred in the past on District lands, *see* Plan, pp. 5-7 - 5-15 but the DEIR does not provide any followup information or analysis about the effectiveness of those treatments or whether herbicides had to be reapplied. This information is relevant to the DEIR's evaluation and should have been made available as part of the District's ostensible monitoring program.

B. DEIR Fails to Adequately Describe the Project

13-05

Under CEQA, the DEIR must contain an adequate project description. *See County of Inyo v. City of Los Angeles* (1977) 71 Cal. App.3d 185, 192-193. Under CEQA, the term 'project' is defined 'broadly' and encompasses "the whole of an action which has a potential for resulting in physical change in the environment, directly or ultimately, and includes the activity which is being approved and which may be subject to several discretionary approvals by governmental agencies." *Burbank-Glendale- Pasadena Airport Authority v. Hensler* (1991) 233 Cal. App. 3d 577, 592.

1. DEIR Fails to Acknowledge the Substantial Toxicity of Herbicides as a Component of the Project to Humans and Animals.

The DEIR states that "[i]n general, the use of herbicides does not pose unacceptable risk to humans and ecological receptors. This is because herbicides are designed to be highly selective for plants." The DEIR explains:

13-06

> [T]he mechanism of action (i.e. the manner in which herbicide products produce the desired effect in plants) is not shared between plants and non-plant receptors, such as human and animals. For example, the active ingredient of an herbicide may exhibit selective toxicity to plants through selective inhibition of an enzyme found exclusively within plants. This specificity generally renders herbicides *practically non-toxic to non-plant organisms* and significantly contributes to the safety of their use and reduces the likelihood of adverse impacts."

DEIR, p. 259 (emphasis added.)

This assertion that herbicides are practically non-toxic is demonstrably false and misleading. In fact, several of the herbicides proposed, including glyphosate and triclopyr, are highly toxic to wildlife and humans, particularly as applied in their product forms. As discussed more fully in the comments of Sharon Rushton, Ann Spake and Laura Chariton on behalf of Sustainable Tam/Almonte *et al.* (Sustainable Tam/Almonte Comments), glyphosate, and its products in particular, may cause adverse impacts to wildlife and humans at dose and concentration levels that would qualify as highly toxic under the EPA chart utilized by the DEIR.

13-06 (cont.)

Further, as discussed below, these herbicides may cause harm to species without causing a direct and immediate fatality. Such ‘sub-lethal’ impacts may occur at doses and concentrations that demonstrate high toxicity. *See Appendices for MMWD Herbicide Risk Assessment,* obtained at http://www.marinwater.org/183/Wildfire-Protection-Habitat-Improvement, attached hereto as Exhibit A (hereafter “Herbicide Risk Assessment Appendix.”)

For example, for bird impacts, glyphosate has been found to have reproductive effects on ducks at an exposure of 3.7 ppm per day. *See* Herbicide Risk Assessment Appendix, p. A-18.

Glyphosate and its products have also been found to have a whole suite of sublethal – but still very harmful – impacts to fish, such as observable impacts to rainbow trout physiology at concentrations ranging down to .74 ppm. Others studies have shown a median No Observable Effect Level (NOEL) in fish of 0.11 ppm. *See* Herbicide Risk Assessment Appendix, p. A-24.

For amphibians, glyphosate and its products are particularly harmful. Studies have shown that doses of Roundup at concentrations of 1.9 ppm were sufficient to kill half a western toad population over a 16 day period, and only 1 ppm of Roundup was necessary to do the same to a tree frog population. *See* Herbicide Risk Assessment Appendix, p. A-24. For the wood frog, a dose of only 0.41–0.98 ppm was necessary to kill half the population. *Id.* at 25. For the 16 day studies in which amphibians were exposed four times, the LC-50 was between .41 and 1.9 ppm. *Id.* at 24-25. The concentration of Roundup required to kill 100% of these amphibian populations was 3.7ppm. *Id.* at A-26.

For sublethal impacts to amphibians, the toxicity numbers are even lower. There, glyphosate products had harmful effects on growth, development and morphology at doses at concentrations ranging from .60 to 1.8 ppm, with the median growth or development LOEL at 0.71 ppm (as stated in mg/L.). *Id.* at A-27. Similarly low numbers also occur for aquatic invertebrates (adverse effects at .17 ppm). *See id.* at pp. A-29 - A-30.

Further numerous studies show the broad application of glyphosate and its products may substantially harm and reduce populations of small mammals (*id.* at pp. A-10 - A-15) as well as insects, arachnids and other invertebrates. *Id.* at pp. A-19 - A-20.

Similar studies show the same high toxicity levels for triclopyr, and its associated products. *Id.* at pp. A-31 - A-37.

In sum, the DEIR’s statement that herbicides are ‘practically non-toxic to non-plant organisms’ is misleading and does not meet the informational requirements of CEQA. *See e.g., Mira Monte Homeowners Assn. v. County of Ventura* (1985) 165 Cal. App.3d 357, 365 ("The value of an EIR is as an informational document...It is ‘the 'heart' of CEQA, the principal method by which environmental data are brought to the attention of the agency and the public")

13-06 (cont.)

Here, most of these pesticide impact levels would quality as 'highly toxic' under the EPA scorecard relied on in the DEIR. *See* DEIR, p. 261. As discussed below, the DEIR's failure to identify the relevant toxicity end points undermines the DEIR's ability to evaluate the potentially significant impacts of applying these chemicals to the Marin environment.

2. The DEIR Fails to Provide Adequate Information about How Herbicides Will be Applied.

The DEIR is vague about how herbicides will be applied in three ways.

13-07

First, the DEIR does not clarify the scope of herbicide use. Instead, the DEIR states that "[i]plementation of a project to *remove nonnative vegetation, restore native habitat, or manage fire fuels* located on the preserve would involve a number of physical activities that could result in environmental change," including application of "conventional herbicides." *See* DEIR, p. 18 (emphasis added.) *See also* Plan p. 7-23 (BMP- FUEL MANAGEMENT-2 "Use of Herbicide During Fuel Management," stating that herbicides applications will be part of an IPM approach in fuel reduction activities.)

Here, while the Plan and DEIR appear to allow and envision the use of herbicides as part of fuel reduction or restoration activities, the DEIR contains no discussion or analysis of how this would occur or whether there were any limits how herbicides could be used.

Second, beyond general descriptions and parameters, the DEIR does not identify how herbicides will be applied in the field, what percentage of weed treatments would, for example, be done through broadcast methods, as opposed to spot treatments.

Instead, the DEIR states that "[t]reatment methods utilized by the MCOSD include hack-and-squirt, cut-stump, basal bark, thin line, rope wick, and foliar applications including spot and broadcast treatments." *See* DEIR, p. 275. The DEIR defines "foliar application" as:

13-08

> [A] broad category of applications that includes all applications where herbicides are sprayed directly onto foliage using one of many equipment options including *backpack-based applicators, truck mounted wands, and all-terrain vehicle (ATV) drawn booms.* Depending on the equipment and methods used, f*oliar applications range from highly targeted in nature (e.g., spot sprays with backpack-based applicators), with treatments targeting individual plants, to broadcast in nature (e.g., truck mounted wands, ATV drawn boom), with treatments targeting clusters of plants*. Depending on what the herbicide label allows, foliar applications may occur in or near (less than 100 feet) water.

See DEIR, p. 276. (emphasis added,.)

Here, more information is necessary to understand the level of environmental or health damage that may occur. For example, how many acres will be sprayed, how much spot vs.

13-08 (cont.)

broadcast spraying etc.? The DEIR and Plan suggest in places that herbicides would typically be applied by backpack applicators using foliar sprays, but nothing in the documents would require this to be so.

13-09

Third, despite its frequent reference to label requirements, the DEIR does not describe or explain how label requirements will affect how herbicides will be applied. The DEIR states:

> Herbicide labels are the written, printed, or graphic matter on, or attached to, the herbicide product or any of its containers or wrappers. It describes the required personal protective equipment (PPE) the herbicide applicator must wear; how and what quantities of herbicide may be applied; the specific plants it may be used to control; any restrictions on application timing (e.g., not prior to a rain event); and the environmental conditions in which it may be applied (e.g., in or near water).

See DEIR p, 244. The DEIR does provide Exhibit 5.5-2 showing some characteristics of label requirements for the different herbicide products proposed. However, to the extent that information is presented, none of it explains how labels will be protecting workers and the environment,. Instead, the chart shows generally that pursuant to their labels, the herbicides may be applied within 100- feet of water or other sensitive habitats using either hand-held or broadcast methods. *See e.g.,* DEIR, p. 247 (label for glyphosate product states "Foliar applications may be made using backpack-based applicators, truck mounted wands, or ATV drawn booms. Applications are frequently made far from surface water (greater than 100 feet), although *applications may be made in or near surface water*.") (emphasis added.)

13-10

As a result of these failures of description and information, the public is left to understand the project as essentially open-ended regarding actions, methods and application techniques involving herbicides in Marin's environment.

13-11

3. The DEIR Does Not Disclose the Extent or Physical Terrain Features of the Invasive Weed Infestations Proposed to be Removed by Herbicides

The DEIR also does not provide adequate information about the extent or locations of weed infestations where herbicide applications may be applied under the Plan, or relevant information on the physical features or environmental sensitivities where these infestations occur. Similar as discussed above, such information is also necessary for the public and decision-makers to understand the actual scope of the project and the potential environmental impacts that could arise.

13-12

4. The DEIR Does Not Identify How the Project Will Protect Sensitive Natural Resources Listed in Table 2-1 of the Plan.

Table 2-1 in the Plan lists "Sensitive Natural Resources," s*ee* Plan, pp. 2-7 - 2-29, that will presumably receive protection buffers required under BMP-Invasive Plant-2, which requires

13-12 (cont.)

the District to limit herbicide use within 100 feet of sensitive natural resources. However, neither the Plan nor the DEIR present any information about the location of these resources within the District's parcels, except to disclose that they occur.

Thus for example, in the Terra Linda/Sleepy Hollow Divide preserve there are the following sensitive natural resource communities: • California bay, alder, big leaf maple, willow riparian forest; • Cliffs, rock outcrops; • Coyote brush alliance; • Madrone, California bay, tanoak; Purple needlegrass; • Rocky serpentine grasses; • Serpentine balds; • Tall temperate perennial herbaceous; • Undifferentiated marsh; • Upland serpentine grassland; • Valley oak alliance; • Valley oak, coast live oak; • Valley oak/grass. *See* Plan, Table 2-1, p. 2-27.

Many of these areas appears also to have significant invasive plant infestations. *See id.*. Yet the DEIR provides no information about how so many sensitive resources would be protected with a 100 foot buffer, how such a buffer would be drawn around these vegetation type communities or other sensitive natural resources occurring on the District's parcels, or how herbicides that would be used within these communities would avoid significant impacts due to spray drift or runoff of toxic chemicals. As discussed below the proposed amendment to BMP Invasive Plant - 2 called for by Mitigation Measure 5.5-1 to allow for the development of a 'Treatment Program' for herbicide applications within these areas constitutes deferred mitigation and does not support a finding in this case of insignificant impacts.

C. DEIR Fails to Identify the Significant Environmental Impacts of the Proposed Project, Including the Broad Application of a Variety of a Highly Toxic Pesticides into Marin's Environment.

13-13

The DEIR's impact analysis states the following with regards to herbicides and impacts:

> The draft VBMP recommends a range of possible treatment options for the target invasive plants. These treatment options fall into three categories: hand and machine control methods, chemical control methods, and other treatment methods. Chemical control methods include the use of herbicides. Currently, the MCOSD conducts herbicide treatments to control a variety of invasive vegetation. As discussed in Section 5.5 Hazards - Herbicide Use, the draft TPEIR studies 28 different application scenarios. For non-plant ecological receptors, *six of the scenarios would result in a significant impact.*

See DEIR, p. 46 (emphasis added.) The DEIR overrides this finding based on the following:

> The conclusions regarding exposures to aquatic invertebrates and fish are largely driven by the exposure evaluation, which consistent with what the product labels allow, evaluated products as being applied "in" or "near" water. ..
>
> Generally, *herbicides are practically non-toxic to humans and animals* and many conservative assumptions were made in the process of characterizing toxicity (e.g.,

13-13 (cont.)

> assuming high receptor sensitivity) and exposure (e.g., assuming direct exposure to applied herbicides) to these receptors....*failure to pass first tier screening thresholds does not necessarily indicate actual risk, but instead reflects the potential for risk and the need to progress to a higher tier analysis.*
>
> Appropriate buffers would be provided around sensitive natural resources, consistent with BMPs in the draft VBMP. These typically call for establishing a 100-foot buffer around sensitive natural resources, including wetlands, streams, occurrences of special-status species and sensitive natural communities (see discussion in Section 5.1 Biological Resources). *However, exceptions to treatment within this standard buffer zone may be necessary for invasive species control and eradication, particularly where they pose a substantial threat to the sensitive resource.*

DEIR, pp. 265-266 (emphases added.) To address this last issue, the DEIR proposes Mitigation Measure 5.5-1, which revises BMP-Invasive Plant-2 to add the following language:

> Where herbicide treatment within a minimum 100-foot buffer is considered essential to control the invasive species and reduce the threat to sensitive natural resources, *the MCOSD will prepare a treatment program*, as called for in BMP-Sensitive Natural Resources-1 to ensure careful controls are fully implemented and conditions adequately monitored.

DEIR, p. 266 (emphasis added.) The DEIR then concludes that based on this measure, the creation of a future 'treatment program,' significant impacts would be avoided:

> Adoption and implementation of Mitigation Measure 5.5-1 together with the additional mitigation measures identified in this section would reduce adverse effects to ecological receptors to a less-than-significant impact. Through the use of buffer zones, as well as least harmful application methods such as spot spray treatments, exposure to non-target species through drift, runoff, erosion, and direct contact would be significantly reduced or prevented entirely. Where buffer zones or the use of least harmful application methods are not feasible, *preparation of a treatment program that considers site-specific conditions, threats, and benefits to sensitive natural resources while incorporating the latest adaptive management practices would ensure that there is no additional significant impact.*

DEIR, p. 269 (emphasis added.)

As discussed below the DEIR fails to provide an accurate and adequate analysis to support this claim of insignificant impacts and thus fails as an informational document.

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13-14

1. The DEIR Does Not Adequately Characterize the Risk Posed By Herbicide Treatments to the Environment.

The DEIR's impact analysis - which purports to have run 28 different application scenarios and found six scenarios would result in significant impacts for non-plant ecological receptors – is based on multiplying the toxicity score for a particular active ingredient by the exposure score for that ingredient to come up with a "risk score" to determine significance:

> For each application scenario, significant impacts for each ecological receptor group were evaluated by estimating a risk score based on the toxicity (1 to 5) and exposure scores (1 to 3). The risk score was calculated by multiplying the toxicity score by the exposure score (e.g., a scenario with a toxicity score of 4 and an exposure score of 3 would have a risk score of 12). For risk scores equal to or below 5, a conclusion of no or less-than-significant impact was made, while for risk scores exceeding a value of 5, significant impact was concluded.

DEIR, p. 263. As discussed below, this approach is improper and thus contrary to CEQA.

13-15

a. Toxicity Standards for Wildlife Limited to Lethal Impact Measurements

The DEIR relies for its toxicity scoring on toxicity figures from EPA studies designed to kill one half the population of a species, described as the LC-50 (concentration at which 50% of the population dies) and LD-50 (dose at which 50% of the population dies.) *See* DEIR, p. 261; Appendix E, pp. E-10 - E-19.

However, as the DEIR itself acknowledges, there are other harmful endpoints such as "reduction in growth," "reproductive impairment," or "disruption of community and ecosystem-level functions" that merit discussion when assessing the potential for adverse impacts. *See* DEIR, p. 262. Inclusion of these and other relevant endpoints – clearly harmful to wildlife – results in many herbicide products receiving higher toxicity scores, including glyphosate, triclopyr and their associated products. *See* Sustainable Tam/Almonte Comments; Herbicide Risk Assessment Appendix, A-18 - A-37.

For example, with respect to glyphosate, studies show that Roundup products may adversely affect fish, amphibians and aquatic invertebrates in aquatic habitats at concentrations below one part per million, making those chemicals 'highly toxic' under the DEIR's chart.

Other studies show that 'doses' of glyphosate produces containing concentrations well below 1 ppm lead to a host of adverse impacts for amphibians' growth, development and morphology. *See* Herbicide Risk Assessment Appendix, p. A-24. Similar low levels of glyphosate product may affect birds such as mallard ducks, invertebrates, and small mammals. *Id.*, p. A-18 - A-30. *See also* Sustainable Tam/Almonte Comments.

13-15 (cont.)

The same is true to triclopyr. *Id.* at A-31 - A-37.

The DEIR's failure to consider sub-lethal endpoints as part of its toxicity rating undermines it conclusion that potential exposures at these concentrations do not have the potential for significant effects.

b. Toxicity Standards Do Not Consider Toxicity of Herbicide Products.

13-16

The DEIR's toxicity standards also do not consider the enhanced toxicity of herbicide products, particularly those with glyphosate as the active ingredient. As discussed more fully in the Sustainable Tam/Almonte Comments, the toxicity levels for herbicide products containing glyphosate may be many times higher than for the toxicity of the active ingredient alone. *See* Herbicide Risk Assessment Appendix, A-18 - A-30.

c Toxicity Standards are Incomplete and/or Inaccurate.

13-17

The toxicity standards lack data for terrestrial exposures to small mammals, reptiles and amphibians, instead relying on surrogate species to establish toxicity benchmarks. Further, the numbers utilized are misleading and do not consider chronic exposures that may occur over a longer time frame. Indeed, numerous studies show reductions in populations and other adverse effects to small mammals populations at applications of glyphosate products of under 2 kilograms per hectare over periods longer than one year. *See* Herbicide Risk Assessment Appendix, A-10 - A-16. Other studies show similar reductions in terrestrial invertebrate populations at less than 1 kg per hectare applications of glyphosate products. *See id.,* p. A-20. The same issues apply for triclopyr as well. *See id.,* p. A-31 - A-37.

13-18

For aquatic toxicity, the DEIR in fact finds that the significant impacts that did result from its calculations to aquatic species, *see* pp. 46, App. E, pp. E-61 - E-93, would be rendered less than significant because any contamination would be quickly diluted and then disappear:

> Since herbicide concentrations in waters decrease substantially with longer residence times and higher dilution rates, *any water quality impacts would be localized and would dissipate quickly*.

DEIR, p. 175 (emphasis added.) However, this assumption does not consider herbicide applications that might occur in periods of low water flow, where a substantial drift or runoff from an herbicide application could foreseeably result in a significant change to the water quality and aquatic habitat offered by a particular water body in Marin.

13-19

d. DEIR's Hazard Rating for Herbicides is Flawed.

The DEIR's failure to consider the above factors as part of it toxicity rating skews the analysis by allowing the District to consider herbicides as less toxic to wildlife than they actually

13-19 (cont.) are. Under the DEIR's approach, for example, the toxicity score of glyphosate products for birds should not be "practically non-toxic" – as is stated in the DEIR Appendix E charts, *see* p. E-10-11 – with a score of 1, but rather at least moderately toxic based on the impacts observed on mallard ducks, discussed above. This higher score would bump up the impacts to susceptible bird populations for glyphosate products from one that was calculated to be 'insignificant' to one that was 'significant.' *See* DEIR, Appendix E, p. E-61 (impacts of foliar spraying to birds considered insignificant due to assigned toxicity score of 1, based on assumption that product is "practically non-toxic" to birds.")

The same is true for other species, terrestrial and aquatic amphibians, mammals, reptiles, fish, and aquatic and terrestrial invertebrates,. As discussed, the higher toxicity of glyphosate and triclopyr products means that the DEIR has failed to adequately present the risks posed. *See* App. E, pp. E-61 - E-93.

e. DEIR's Exposure Rating for Herbicides is Flawed.

The DEIR's exposure rating for herbicides proposed for use is also flawed.

First, the DEIR wrongly assumes that Glyphosate and its products are short lived in the environment, and thus will have low exposure rates, particularly to terrestrial wildlife and
13-20 humans. However, as noted in the Sustainable Tam/Almonte Comments, these chemicals may persist in the environment for months and even years after application. As discussed, the type of long term chronic adverse impacts that may occur from such persistent herbicide exposure may be harmful to wildlife at levels well below the amount relied on in the DEIR to determine toxicity. *See* Herbicide Risk Assessment Appendix, A-10 - A-16. This would be particularly problematic in places where the District might choose to conduct repeat sprayings, such as to prevent the resprouting of broom.

Second, for all herbicides, the DEIR does not provide information on how the different applications will 'expose' the surrounding environment to herbicide contamination. For example, other agencies have noted that an expected spray drift for a foliar application, even
13-21 from a backpack operation, would still be approximately 30 meters or 90 feet. However, the DEIR provides no information about the amount of either backpack or broad-based applied herbicides that could be expected to come into contact with non-target resources in Marin.

The DEIR does not explain how its application methods, either outside *or* inside the purported 100 foot buffer for sensitive natural resources, would avoid significant impacts to both terrestrial and aquatic environments. For aquatic species there is no explanation for how low
13-22 flow seasonal herbicide applications, or applications during the rainy season where surface water runoff may occur, can cause substantial impairments to water quality and aquatic habitat. For terrestrial species, the DEIR does not contain any analysis based on the amount of product that might be used and thus provides no information from which one might extrapolate an exposure

model based on basic study methods for terrestrial species impacts. *See e.g.,* Herbicide Risk Assessment Appendix, A-10 - A-16.

As a result of the District's flawed assumptions on herbicide exposure, its impact calculations are skewed. *See e.g.,* DEIR, p. 175 ("Since herbicide concentrations in waters decrease substantially with longer residence times and higher dilution rates, *any water quality impacts would be localized and would dissipate quickly*.") (emphasis added.)

f. DEIR's Risk Calculation for Herbicides is Flawed.

13-22 (cont.)

The combination of flawed toxicity and exposure scoring leads to a flawed calculation, as reported in the DEIR, Appendix E, pp. E-61 - E-93. These calculations are flawed because they are based on underlying ratings for toxicity and the potential for a non-target to be exposed to that toxicity that do not comport with available science, particularly on the herbicide ingredient glyphosate and its attendant products. *See* Sustainable Tam/Almonte Comments; Herbicide Risk Assessment Appendix, pp. A-18 - A-30.

As discussed, DEIR Appendix E, p. E-61 found that impacts of foliar spraying to birds to be insignificant due to an assigned toxicity score for glyphosate products of 1, based on assumption that the herbicide was "practically non-toxic" to birds." Elsewhere, impacts to terrestrial species – including humans – are understated based on the unsupported assumption that the herbicide will not persist in the environment.

The DEIR concludes that "[f]or non-plant ecological receptors, 22 of the 28 application scenarios evaluated showed no or less-than-significant impacts," *see* DEIR, p. 46, but this conclusion is flawed, given the DEIR's reliance on inadequate standards in its calculation of impacts. Here, the DEIR's risk calculations are flawed because they underestimate both the potential toxicity of and level of exposure that may occur due to implementation of the Project.

The result is a misleading presentation that does not comport with CEQA requirements. *See e.g., Mira Monte Homeowners Assn. v. County of Ventura, supra,* 165 Cal. App.3d at 366 ("In reviewing an EIR a paramount consideration is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the formulation of any decision.....Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal . . . and weigh other alternatives in the balance.")

2. The DEIR Does Not Address the Risk Posed by Herbicides to Animals.

The DEIR does not provide a meaningful evaluation of the impacts of the Project on wildlife in Marin. As discussed, the DEIR proceeds under the flawed assumption that herbicides are generally non-toxic to wildlife, despite the wealth of scientific study to the contrary. Even

13-22 (cont.)

where it purports to conduct a risk assessment, that assessment is based on outdated numbers that do not consider certain likely exposure paths, or the fact that certain 'sub-lethal' impacts caused by herbicides such as reduced growth and development, or endocrine effects on the reproductive system, may be substantially harmful in the long term, though not immediately fatal in the moment. The result is a flawed risk assessment process, which masks the potential impacts that may occur from herbicides being used in these habitats.

13-23

The DEIR also assumes that impacts to wildlife will be avoided through 'labels' issued for the herbicide products, as well as a BMP that will require development of a 'treatment program' for future applications of herbicides adjacent to sensitive natural resources. However, as discussed below, the labels for both glyphosate and triclopyr products allow for use broad based foliar spraying, including near sensitive natural areas. Nothing in the labels will protect wildlife in these areas. *See* DEIR, p. 276 ("Depending on what the herbicide label allows, foliar applications may occur in or near (less than 100 feet) water.") Further, as also discussed below, the development of a later 'treatment program' is deferred mitigation, unlawful under CEQA.

13-24

In our view there are many circumstances in which possible herbicide applications in the field might cause substantial aquatic or terrestrial contamination either through direct spraying, air drift or runoff, which could adversely affect wildlife. As just one example, many aquatic reptiles and amphibians have tremendous upland habitat ranges that they occupy during the non-breeding season. Many of these upland habitats would not be protected by the 100 foot buffers around breeding ponds and streams, nor would their corresponding aquatic habitats necessarily be protected by an undefined 'treatment program' agreed to by the District, particularly given that the District's risk calculations for these types of species understates or skews the likely harm that may occur due to exposure.

This is just one of many examples where wildlife may be harmed in a manner that is not being acknowledged or analyzed in the DEIR.

3. The DEIR Does Not Address the Risk Posed by Herbicides to Plants.

13-25

The DEIR contains virtually no information about the risks posed to plants and sensitive plant communities from herbicide applications, particularly the foliar spraying envisioned for each of the proposed herbicide active ingredients. As discussed, foliar spraying may likely cast a wide net of direct exposure to plant communities, including treatments that are "broadcast in nature (e.g., truck mounted wands, ATV drawn boom), with treatments targeting clusters of plants." *See* DEIR, p. 276. Moreover, even focused backpack spraying will like involve drift to non-target plants, at least up to 90 feet away from the point of application.

The DEIR acknowledges direct high toxicity of herbicides to plant targets. However, for sensitive plants and plant communities the DEIR provides no explanation for how these type of impacts could be avoided, particularly true given the incredibly valuable sensitive natural plant resources that occur throughout the District's lands. *See* Plan, Table 2-1.

4. The DEIR Does Not Address the Risk Posed by Herbicides to Humans.

13-26 The DEIR's risk assessment for glyphosate effects on humans in flawed because the 1) toxicity standards used are too low and do not incorporate recent science; and 2) the exposure assumptions are incorrect as they are based on a glyphosate not persisting in the environment beyond 4 days after application. *See* Sustainable Tam/Almonte Comments.

5. The DEIR Does Not Adequately Address the Risk to Water Quality.

The DEIR acknowledges potentially significant impacts from herbicides on water quality:

> Herbicide application could occur when rainfall and stormwater runoff could mobilize herbicides and/or their by-products and convey them to ponds, lakes or creeks. This has the potential to be a significant impact on water quality standards as set forth in the NPDES General Permit and the Diazinon and Pesticide Toxicity in Urban Creeks TMDL described in the Bay Basin Plan....
>
> 13-27
>
> Given these assessed toxicities, and the potential for wet season herbicide applications within 100 feet of creeks, rivers, ponds, springs and seeps, surface runoff and/or degraded groundwater discharge, project implementation could result in substantial additional sources of polluted runoff reaching these sensitive water resources within the preserve areas.

DEIR, pp. 30, 36. However, the DEIR does not address impacts of the plan to water quality, except to assert that the 'treatment program' required when herbicide applications would occur next to water bodies will ensure that no significant impacts will occur. *See e.g.,* DEIR, p. 176 ("Implementation of Mitigation Measure 5.2-1 [future Treatment Program] would reduce the project impact on the quality of stormwater runoff to a less-than-significant level by asserting restrictions on the *timing, conditions and types* of herbicides used near sensitive water bodies.") (emphasis added.)

As discussed below, the DEIR cannot rely on this type of deferred mitigation given that none of these parameters are set forth in the Plan or DEIR. The DEIR does not explain what will be the timing, conditions and types of herbicides restrictions that will avoid affecting beneficial uses for wildlife usage.

13-28 Further, as also discussed below, the DEIR does not address the project's cumulative effects on water quality in combination with other sources of pesticides within the watersheds in which the District operates, both from other land agencies in Marin and the general public.

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13-29

6. The DEIR Does Not Address Herbicide Impacts Causing Further Exotic Weed Infestation.

The DEIR does not evaluate the possibility that herbicide applications, by eliminating whole areas of vegetation through the spraying process, may in fact induce further invasive weed infestation, thereby contributing to a vicious cycle in which more and more herbicides are needed to 'manage' the surrounding environment.

This potential is particularly problematic given the known association between the creation of fuelbreaks and the spread of invasive weeds, as discussed below. Here, the concern is the DEIR has not addressed the real life interactions in which areas are cleared for fuel protection, quickly occupied by invasive species, thereby leading to a potentially endless cycle of herbicide management on Marin's open space lands.

D. The DEIR Fails to Assess the Cumulative Impacts of Herbicide Treatments

13-30

In our view the DEIR fails to present an adequate cumulative impact analysis under CEQA of how the Project will interact with past, present and future actions in the region to create cumulative effects. *See* 14 Cal, Code Reg. § 15130(b) (CEQA requires discussion of cumulative impacts to include "past, present, and reasonably anticipated future projects.")

A cumulative impact analysis must be informationally adequate, with clear analysis of the relevant issues. *See Citizens to Preserve the Ojai v. County of Ventura* (1985) 176 Cal. App.3d 421, 431 ("A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decision maker's perspective concerning the environmental consequences of the project, the necessity for mitigation measures, and the appropriateness of project approval.")

13-31

1. The DEIR Does not Assess the Persistence of Herbicides in the Environment as part of its Cumulative Impact Analysis.

The DEIR does not assume any overlap of herbicide applications based on the assumption that herbicides applied will be short-lived in the environment. However, as discussed in the Sustainable Tam/Almonte Comments, this assumption is unwarranted. Thus the DEIR must assess the cumulative effects of repeat herbicide applications in an area still containing herbicide residues from the prior application, thereby contributing to cumulative exposures and toxicities.

13-32

2. The DEIR Does Not Address the Potential Cumulative Impacts of Using Herbicides in Conjunction With Fuel Management Activities.

The DEIR does not address the manner in which herbicide use may cause cumulatively significant impacts in conjunction with fuel management activities also being proposed:

13-32 (cont.)

> A recurring theme during interviews about fuel modification zones was the need to address and minimize invasive plant spread and establishment within these zones. Most agencies indicated that they have had to redirect a large portion of their fuel management funding away from construction of new fuel modification zones to controlling or containing infestations of invasive plants, such as French broom, within already constructed fuel modification zones.

See Plan, p. 3-28. The Plan demonstrates also that herbicides will or could be a regular option in controlling potential weed spread. *See also* Plan p. 7-23 (BMP- FUEL MANAGEMENT-2 "Use of Herbicide During Fuel Management," stating that herbicides applications will be part of an IPM approach in fuel reduction activities.); pp. 5-3 - 5-15 (summaries of ongoing fuel breaks on District lands requiring ongoing herbicide applications).

13-33

3. The DEIR Does Not Address the Potential Cumulative Impacts of Using Herbicides in Way that Leads to More Herbicide Use.

As discussed, the DEIR does not address the possibility that the increasing use of herbicides, including as part of the creation of fuel breaks, will harm non-target plants, thereby creating ideal conditions for the further spread of weeds, which will require more herbicide use. The DEIR does not consider or evaluate the potentially significant cumulative impacts that could arise from this vicious cycle.

13-34

4. The DEIR Does Not Consider the Cumulative Impacts of its Herbicide Applications in Combination with Other Agencies and Private Use.

The DEIR does not address the cumulative impacts of its herbicide use in combination with other herbicide uses including 1) other local agencies applying pesticides as part of their operational activities; and 2) private uses of pesticides that may contribute to significant cumulative effects.

The DEIR does refer to the TMDLs for pesticides set for the waters that may be affected by herbicides proposed to be used under the Plan, but does not calculate how further incremental contributions to the overall pesticide load in Marin's waters from all these uses is not cumulatively significant under CEQA.

Here, the DEIR does not address the regional setting as required by CEQA. *See* 14 Cal. Code Reg. § 15125 (significant cumulative effects of the project must be considered in the *full environmental context*.") (emphasis added.)

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E. The DEIR's Mitigation is Contrary to CEQA.

1. The DEIR Unlawfully Defers the Identification of Mitigation Measures Intended to Avoid Significant Impacts from Herbicide Treatments.

The DEIR defers the formulation of its most important mitigation measure with respect to herbicides, in the form of the revised BMP-Invasive Plant-2 , which states:

13-35

> Limit Herbicide Use within 100 feet of sensitive natural resources. Where possible ensure use of least harmful method to conduct vegetation management (e.g. hand control, mechanical control, cultural controls). Where herbicide treatment within a minimum 100-foot buffer is considered essential to control the invasive species and reduce the threat to sensitive natural resources, the *MCOSD will prepare a treatment program,* as called for in BMP-Sensitive Natural Resources-1 to ensure careful controls are fully implemented and conditions adequately monitored.

The DEIR explains the treatment program, which will address water quality and biological impacts as the same time, as follows:

> As discussed under Impact 5.2-1, herbicides may be applied within 100 feet of creeks, ponds, or other sensitive aquatic resources where invasive plant control and eradication is deemed necessary to protect other sensitive natural resources. Mitigation Measure 5.1-1 would require the preparation of a treatment program where herbicide application is proposed within these setback zones. The treatment program would evaluate options for treatment and risk to sensitive natural resources, define a preferred treatment program, identify controls for avoiding and minimizing potential adverse effects on the sensitive natural resource, and include requirements for construction and post-construction monitoring. The identified controls could include prescriptions for preferred herbicide products, application methods and prevailing weather conditions; temporary erosion control measures; and permanent measures for erosion control and full site revegetation and maintenance.

p. 176. The DEIR then relies on this to find no significant impacts:

> *Incorporation of the treatment program* proposed under Mitigation Measure 5.1-1 would therefore minimize the risk of local water quality degradation and reduce the project impact to a less-than-significant level.

Id. (emphasis added.)

This approach, of deferring the formulation of a treatment program to address how to avoid herbicide impacts in sensitive habitats, is contrary to CEQA. *See Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 92 (EIR is inadequate if "[t]he

13-35 (cont.)

success or failure of mitigation efforts . . . may largely depend upon management plans that have not yet been formulated, and have not been subject to analysis and review" within the CEQA process.") Nor can the District rely on pat phrases such as 'no net discharge' or other similar aspirational language to assume that impacts will be avoided. *See Communities for a Better Environment v. City of Richmond, supra,*184 Cal. App. 4th at 95. (court rejects generalized goal of "no net increase" in greenhouse gas emissions because the lead agency offered "no assurance that the plan for how Project's greenhouse gas emissions would be mitigated to a net-zero standard was both feasible and efficacious, and created no objective criteria for measuring success."); *POET, LLC v. Cal. Air Resources Board* (2013) 217 Cal.App.4th 1214, 1269 ("We conclude that ARB's statement that its future rulemaking will 'establish specifications to ensure there is no increase in NOx' suffers from the same defect as the net-zero standard for greenhouse gas emissions adopted in CBE – it established no objective performance criteria for measuring whether the stated goal will be achieved.");

Here, the promise to develop a 'treatment program" represents nothing more than a promise to come up with a mitigation plan in the future. Such deferral is unlawful under CEQA. *See e.g, Communities for a Better Environment v. City of Richmond, supra.*

13-36

2. The Monitoring or Adaptive Management Plan Mitigation Lacks Enforceable Standards.

The DEIR appears to rely in part on adaptive management as a means to avoid significant impacts due to herbicides. *See e.g.,* DEIR, p. 246 ("Monitoring and adaptive management principles, both on the project level and on the program level, are provided to help ensure improvements in efficiency and effectiveness of pest control over time.")

The purpose of adaptive management is to improve long-term management outcomes, by recognizing where key uncertainties impede decision-making. However, such as approach can only work as mitigation if it is tied to firm and enforceable performance standards, as well as triggers for action in the event that the monitored activity is detected causing significant effects to the resource. *See e.g., See* Pub. Res. Code § 21081.6(b); 14 Cal. Code Regs. § 15126.4(a)(2); *Federation of Hillside and Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1261 ("The purpose of these requirements is to ensure that feasible mitigation measures will actually be implemented as a condition of development, and not merely adopted and then neglected or disregarded."); *Lincoln Place Tenants Assn. v. City of Los Angeles* (2005) 130 Cal. App. 4th 1491, 1508-09 (city could not ignore the mitigation it imposed on the redevelopment project because "[m]itigating conditions are not mere expressions of hope.")

Here the DEIR does not present any monitoring plan or adaptive management program that would establish how significant impacts occurring due to herbicide use would be quickly identified and remedied. Instead, the Plan leaves it up to future District discretion as how this program will run.

3. The DEIR Cannot Rely on Following Label Instructions or Compliance with State and Federal Pesticide Laws to Assume No Impacts from Herbicide Applications.

13-37

As discussed, the DEIR does not describe or explain how label requirements will affect how herbicides will be applied and thus cannot rely on following labels as a way to avoid significant impacts. *See e.g,* DEIR, p. 244 (states only aspects of use that labels may address.) Indeed, as noted, to the extent the Plan address label requirements, it is to affirm their broad authorizations of use, consistent with the pesticide-friendly federal registration laws under FIFRA. *See e.g.,* DEIR, p. 247 (label for glyphosate product states "Foliar applications may be made using backpack-based applicators, truck mounted wands, or ATV drawn booms. Applications are frequently made far from surface water (greater than 100 feet), although applications may be made in or near surface water.")

Further, the DEIR's and Plan's suggestion that significant impacts from herbicides will be avoided by compliance with state and federal laws was rejected by the Supreme Court in *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936:

> CDF therefore had no grounds to state in its response to public comments that because of the Department of Pesticide Regulation's registration program "we do not have the authority to approve or disapprove any project regarding the use of chemicals." ...Nor was CDF correct in concluding that any use of an herbicide in compliance with Department of Pesticide Regulation label restrictions necessarily "would not have a significant effect on the environment." (*See Californians for Alternatives to Toxics v. Department of Food & Agriculture, supra*, 136 Cal.App.4th at p. 17 ["Nor is there legal authority for the proposition that using registered pesticides according to their labels never results in significant adverse effects."]; *cf. Oregon Environmental Council v. Kunzman* (9th Cir. 1983) 714 F.2d 901, 905 [" 'the mere fact that a program involves use of substances registered under FIFRA [Federal Insecticide, Fungicide, and Rodenticide Act; 7 U.S.C. § 136 et seq.] does not exempt the program from the requirements of NEPA [National Environmental Policy Act of 1969; 42 U.S.C. § 4321 et seq.]' "].)

Id. at 957.

There is nothing in the record that would support the idea that the broad label directions or federal or state laws regulating herbicides proposed to be used in this Plan would avoid under all circumstance the potentially significant impacts of these chemicals on the Marin environment.

13-38

F. The DEIR Fails to Consider an Alternative to Avoid Herbicide Use Where there are Feasible Alternatives.

Under CEQA, a lead agency is required to consider a reasonable range of alternatives to the project, particularly to examine whether there are alternatives that would potentially avoid the

13-38(cont.) significant impacts of the proposed project. *See* Pub. Res. Code §§ 21002, 21002.1(b)); *Save Round Valley Alliance v. County of Inyo* (2007) 157 Cal.App.4th 1437, 1456; 14 Cal Code Regs. § 15126.6 b ("[D]iscussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly.")

Here, the DEIR examines three alternatives to the Vegetation and Biodiversity Management Plan as presently proposed.1) Alternative 1 - No Project Alternative; Alternative 2 - Minimal Management; and 3) Alternative 3 - Risk Reduction. *See* DEIR pp. 18-19. Elsewhere however, the Plan describes how agencies such as MMWD have utilized a non-chemical approach for the removal of broom:

> MMWD is most concerned with controlling broom species. Historically MMWD used herbicides effectively on this species. However, because of a moratorium on herbicide use, the agency currently uses a combination of manual and mechanical methods. MMWD is also experimenting with natural-compound-based herbicides (i.e., herbicides derived from naturally occurring compounds, such as clove oil)..

See Plan, p. 3-24.

Here, the DEIR does not consider an action alternative that would only use herbicides as a last resort based on a finding that other control methods are not feasible to accomplish the task at hand. In our view, such an alternative must be considered, given the potentially significant impacts that could occur from widespread herbicide applications on District lands. *See e.g, Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal. App. 4th 1252, 1264 (EIR "should focus on alternatives that could substantially reduce or avoid one or more of the significant environmental effects while still serving the project's fundamental objectives.")

III. CONCLUSION

13-39 We request that the District withdraw this DEIR and recirculate a new one that 1) correctly and adequately describes the environmental baseline and actual scope of the proposed
13-40 project; 2) accurately identifies the foreseeable significant effects of the Project on the
13-41 environment; and 3) considers an action alternative capable of avoiding such impacts.

Yours Truly,

Michael Graf
On behalf of Community Venture Partners and Sustainable Tam/Almonte

EXHIBIT A

[ATTACHED TO EMAIL SUBMISSION]

Appendices for MMWD Herbicide Risk Assessment

Table of Contents — Appendices

Appendix A: Example Calculation: Allometric Equations

Allometric equations are empirically derived from studies that look at different animals with a variety of body weights and measure the variable of interest (in this case, water intake, food intake or surface area).[1, 2] These allometric relationships take the form:

$$y = aW^x$$

where W is the weight of the animal (in grams), y is the variable to be estimated (usually surface area (in m^2) or food intake (in grams/day or kcal/day), and the model parameters a (sometimes called “alpha” in USFS documents) and x (sometimes called “beta”) are empirically derived. For most allometric relationships of food intake, x ranges from approximately 0.65 to 0.75. Although there is some theory[3] about why the parameter x takes the exact value that it does, determining the coefficients a and x usually requires experimental data.

As an example, the following presents some sample calculations:

$$\textit{Food Intake for Large Mammal} = 1.518 \text{ x } (\textit{BodyWeight})^{0.73}$$
$$= 1.518 \text{ x } (70{,}000 \text{ grams})^{0.73} = 5{,}230 \text{ kcal/day}$$

Or for different species with smaller average body weight:

$$\textit{Food Intake} = 1.518 \text{ x } (60{,}000 \text{ grams})^{0.73} = 4{,}670 \text{ kcal/day}$$

where a = 1.518 and x = 0.73 for large mammals. The estimated food intake of 5,230 kcal/day may seem large compared to similar estimates for a 70-kg human (roughly 2,000 kcal/day). However, wildlife require more energy for thermoregulation and for daily activity.

Allometric relationships are meant to define the average food intake for the average individual within a species. However, there is considerable inter and intra-specific scatter in this relationship. The food intake of a species with average weight of 50 kg may not be well-described by this equation. Even when this equation describes the average food intake of the species well, individuals may differ considerably. For example, young individuals have a higher metabolic rate than older individuals.

Parameters a and x change for different types of animals, and food intake can be expressed in grams instead of calories. For example, small mammals eating a known food type (say insects with 1.5 kcal/g) have an allometric relationship with a = 0.621 and x = 0.584:

A 20 g small mammal consumes = $0.621\ W^{0.584} = 3.57$ grams/day

Surface area is also a function of the organism’s bodyweight. A single pair of a and x values are used to determine surface area for all animals in the risk assessment:

A 20 g small animal has a surface area of = $0.11\ W^{0.65} = 0.771\ m^2$

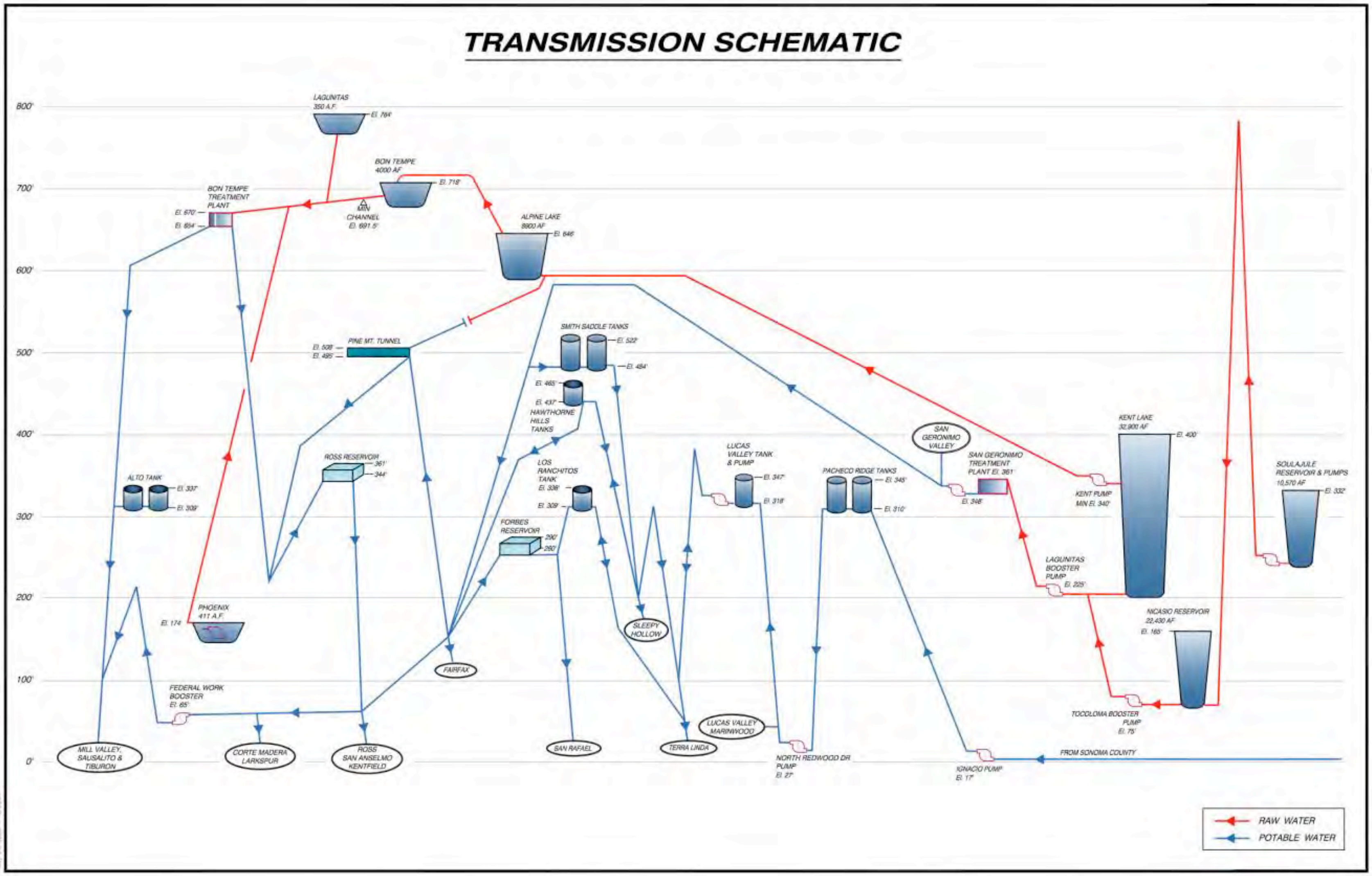
The following Table comes from Section 2.4.3 and presents all of the allometric equations used in the exposure estimates.

Table 2-12. Allometric Relationships for Surface Area, Food and Water Intake

Kcal/day consumed by	**Body weight** (grams)	**Allometric equation**	**Caloric intake** (kcal/day or g)
Small mammal	20	$0.621 * (\text{body weight in grams})^{0.584}$	3.36 grams
Large mammal	70,000	$1.518 * (\text{body weight in grams})^{0.73}$	5,230
Carnivore	Small: 20 Large: 5,000	$1.894 * (\text{body weight in grams})^{0.7}$	Small: 15 Large: 735
Carnivorous bird	1,000	$1.146 * (\text{body weight in grams})^{0.749}$	203
Piscivorous bird	1,000	$0.1 * (\text{body weight in grams})^{1}$	100 grams
All birds	Small: 10 Large: 4,000	$3.12 * (\text{body weight in grams})^{0.604}$	Small: 13 Large: 471

NA = not applicable

1.1 Appendix B: Transmission Schematic for MMWD Reservoirs



1.2 Appendix C: Parameter Sensitivity Test Results

The following tables present the results of the wildlife and human exposure parameter sensitivity tests. The exposure scenarios are described in Section 2.4.3 and the sensitivity tests are described in Section 2.4.4.

In the wildlife table, the subscript for *x* refers to the fact that there are three allometric relationships: surface area (SA), food intake (FI) and water intake (W). The percent increases are based on the central estimates in the original run compared to central estimates in the sensitivity run, or ([(sensitivity central estimate)/(original central dose)]-1) x 100%.

Table C-1: Wildlife Parameter Sensitivity Test Results: Percent change in exposure with change in parameter

Scenario	Receptor	Sensitivity Test: Change allometric exponent: 90% original value, $x_{SA,W}$ 110% x_{FI}[1]	Change allometric exponent: 80% original value, $x_{SA,W}$ 120% x_{FI}[1]	Increase *a* by 110%	Increase *a* by 120%	Caloric Density 50% of Original Value	Caloric Density 75% of Original Value	Body weight 50% of Original Value	Body weight 80% of Original Value	Body weight 90% of Original Value
Acute/Accidental Exposures		**Percent Increase in Central Exposure Estimate (mg/kg-event)**								
Direct Spray										
first-order absorption	Small mammal	29%	66%	10%	20%	0%	0%	27%	8%	4%
100% absorption	Small mammal	29%	66%	10%	20%	0%	0%	27%	8%	4%
100% absorption	Honey Bee	83%	234%	10%	20%	0%	0%	105%	8%	4%
Consumption of contaminated vegetation										
Fruit	Small Mammal	19%	42%	10%	20%	0%	0%	33%	10%	4%
Grass	Large Mammal	126%	410%	10%	20%	100%	33%	21%	6%	3%
Grass	Large Bird	65%	172%	10%	20%	100%	33%	32%	9%	4%
Consumption of contaminated Water										
Accidental spill	Small Mammal	42%	102%	10%	20%	0%	0%	7%	2%	1%
Peak runoff conc.		42%	102%	10%	20%	0%	0%	7%	2%	1%
Consumption of contaminated insects										
	Small Mammal	23%	52%	10%	20%	100%	33%	23%	7%	3%
	Small Bird	15%	32%	10%	20%	100%	33%	32%	9%	4%
Consumption of contaminated fish										
Accidental spill	Fish-eating bird	0%	0%	0%	0%	0%	0%	0%	0%	0%

Scenario	**Receptor**	**Sensitivity Test** **Change allometric exponent: 90% original value, $x_{SA,W}$ 110% x_{FI}[1]**	**Change allometric exponent: 80% original value, $x_{SA,W}$ 120% x_{FI}[1]**	**Increase *a* by 110%**	**Increase *a* by 120%**	**Caloric Density 50% of Original Value**	**Caloric Density 75% of Original Value**	**Body weight 50% of Original Value**	**Body weight 80% of Original Value**	**Body weight 90% of Original Value**
Consumption of contaminated small mammal										
	Carnivorous mammal	134%	98%	21%	44%	100%	33%	57%	45%	19%
	Carnivorous bird	109%	58%	21%	44%	100%	33%	52%	43%	18%
Chronic/Long-Term Exposures		**Percent Increase in Central Exposure Estimate (mg/kg-day)**								
Consumption of contaminated vegetation										
On-site	Small mammal	19%	42%	10%	20%	0%	0%	33%	10%	4%
Off-site	Small mammal	19%	42%	10%	20%	0%	0%	33%	10%	4%
On-site	Large mammal	126%	410%	10%	20%	100%	33%	21%	6%	3%
Off-site	Large mammal	126%	410%	10%	20%	100%	33%	21%	6%	3%
On-site	Large bird	65%	172%	10%	20%	100%	33%	78%	9%	4%
Off-site	Large bird	65%	172%	10%	20%	100%	33%	78%	9%	4%
Contaminated Water										
Water consumption	Small mammal	42%	102%	10%	20%	0%	0%	7%	2%	1%
Consumption of contaminated Fish										
chronic	Fish-eating bird	0%	0%	0%	0%	0%	0%	0%	0%	0%

[1] SA = surface area, W = water, FI = food intake. This sensitivity analysis changed the allometric exponent. The subscript for *x* refers to the fact that there are three allometric relationships: surface area (SA), food intake (FI) and water intake (W). Changing the exponent affects water consumption differently than food consumption. To look at increases in exposure, the food consumption allometric exponent is increased and the water exponent is decreased.

		Percent Increase in Central Exposure Estimate (mg/kg-day)											
		Multiplier Parameters								Exponent Parameters			
	Un-adjusted Dose (mg/kg)	Increase child skin surface area to 6,600 cm^3	Increase child skin surface area to 7,200 cm^3	Adult male body-weight =63 kg	Adult male body-weight =56 kg	Only 75% of chem. drifts to fruit patch	Only 50% of chem. drifts to fruit patch	BCF is 10% high-er	BCF is 20% high -er	Chem. on legs for 2 hours after	Chem. on legs for 4 hours after	15% of chem is dis-lodged	20% of chem is dis-lodged
Worker Accidental/Incidental Exposures (dose in mg/kg/event)													
Contaminated Gloves, 1 min.	$4.2x10^{-6}$	0%	0%	11%	25%	0%	0%	0%	0%	0%	0%	0%	0%
Contaminated Gloves, 1 hour	0.00025	0%	0%	11%	25%	0%	0%	0%	0%	0%	0%	0%	0%
Spill on Hands, 1 hour	0.00055	0%	0%	11%	25%	0%	0%	0%	0%	0%	0%	0%	0%
Spill on lower legs, 1 hour	0.0014	0%	0%	11%	25%	0%	0%	0%	0%	200%	400%	0%	0%
General exposure, backpack	0.026	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
General exposure, ground spray	0.045	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
General Public Acute Exposures (dose in mg/kg/event)													
Direct Spray of Child, whole body	0.021	9.5%	19.5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Direct Spray of Woman, feet and lower legs	0.0021	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Vegetation Contact, Woman, shorts and T-shirt	0.0022	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%	113%
Woman, contaminated Fruit	0.02352	0%	0%	0%	0%	-25%	-50%	0%	0%	0%	0%	0%	0%
Water consumption, child, spill	$8.08x10^{-7}$	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Water consumption, child, ambient	0.0030	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fish consumption, male, spill	$4.43x10^{-9}$	0%	0%	11%	25%	0%	0%	10%	20%	0%	0%	0%	0%
Fish consumption, male, spill	$4.49x10^{-8}$	0%	0%	11%	25%	0%	0%	10%	20%	0%	0%	0%	0%
General Public Chronic/Longer Term Exposures (dose in mg/kg/day)													
Contaminate Fruit	0.013	0%	0%	0%	0%	-25%	-50%	0%	0%	0%	0%	0%	0%
Water consumption	0.000057	0%	0%	11%	25%	0%	0%	0%	0%	0%	0%	0%	0%
Fish consumption	$8.25x10^{-7}$	0%	0%	11%	25%	0%	0%	10%	20%	0%	0%	0%	0%
Fish consumption	$8.79x10^{-7}$	0%	0%	11%	25%	0%	0%	10%	20%	0%	0%	0%	0%

1.3 Appendix D: Toxicity of Glyphosate to Animals and Other Organisms

There is a very large body of literature on glyphosate toxicity. This appendix summarizes studies provided in the EPA Ecotox datasets, Terretox and AQUIRE. Often the studies entered in the EPA database provided equivocal information on important variables that influence the concentration or dose that yields a given endpoint. Not every study reports all of these variables. If the variable is the same across all entries in the table, then it is reported in the table notes. If there is information on statistical significance, it is also included in the table notes. As a summary statistic (which ignores the variation in experimental conditions), we report the median dose that causes an observed effect for all tested organisms in the last line of the table.

A number of variables can affect a given endpoint: "Formulation" refers to the product or chemical mixture used; "Age" refers to the age of the organism; "Study duration" is the amount of time over which the organism was studied; "Type of Exposure" describes the route of exposure and the frequency of exposure to the chemical; "Endpoint" designates the type of endpoint observed (LOEL, NOEL, LC_{50}, etc.) at the specified dose; and "Effect" describes the type of toxicity observed. In aquatic studies, there is the additional "Water Flow" variable that describes the frequency with which water is renewed.

Table D-1: Glyphosate Field Toxicity to Small Mammals

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
	Voles							
Microtus oregoni	Creeping Vole	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M. Newton, J.P. Leeming, and C.L. Chambers	1998
Microtus oregoni	Creeping Vole	Roundup	NOEL	Abundance	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Abundance	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	LOEL	Survival	2.2	21 days	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Survival	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Microtus oregoni	Creeping Vole	Roundup	NOEL	Survival	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Microtus oregoni	Creeping Vole	Roundup	NOEL	Survival	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Microtus oregoni	Creeping Vole	Roundup	NOEL	Survival	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Microtus oregoni	Creeping Vole	Roundup	NOEL	Reproducing organisms	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Microtus oregoni	Creeping Vole	Roundup	NOEL	Reproducing organisms	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Microtus oregoni	Creeping Vole	Roundup	NOEL	Population	2.2	9	Sullivan, T.P., D.S.	1997

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
				change			Sullivan, R.A. Lautenschlager, and R.G. Wagner	
Microtus pennsylvanicus	Meadow vole	Glyphosate	NOEL	Abundance	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Microtus montanus	Montane vole	Roundup	LOEL	Abundance	1.1	1	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Microtus montanus	Montane vole	Roundup	LOEL	Abundance	1.1	1	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Microtus montanus	Montane vole	Roundup	NOEL	Abundance	1.1	1	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Clethrionomys gapperi	Southern red-backed vole	Vision	LOEL	Abundance	1.3	2	Gagne, N., L. Belanger, and J. Huot	1999
Clethrionomys gapperi	Southern red-backed vole	Glyphosate	LOEL	Abundance	2.1	1	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Clethrionomys gapperi	Southern red-backed vole	Glyphosate	LOEL	Pregnant females in a population	2.1	1	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Clethrionomys gapperi	Southern red-backed vole	Glyphosate	NOEL	Survival	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Clethrionomys gapperi	Southern red-backed vole	Glyphosate	NOEL	Biomass	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Clethrionomys gapperi	Southern red-backed vole	Glyphosate	NOEL	Biomass	2.1	5	Sullivan, T.P., C. Nowotny, R.A.	1998

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
							Lautenschlager, and R.G. Wagner	
	Mice							
Peromyscus maniculatus	Deer mouse	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M. Newton, J.P. Leeming, and C.L. Chambers	1998
Peromyscus maniculatus	Deer mouse	Vision	NOEL	Abundance	1.3	2	Gagne, N., L. Belanger, and J. Huot	1999
Peromyscus maniculatus	Deer mouse	Glyphosate	LOEL	Abundance	1.2	1	Ritchie, D.C., A.S. Harestad, and R. Archibald	1987
Peromyscus maniculatus	Deer mouse (adult)	Glyphosate	NOEL	Weight	1.2	1	Ritchie, D.C., A.S. Harestad, and R. Archibald	1987
Peromyscus maniculatus	Deer mouse (adult)	Glyphosate	NOEL	Weight	1.2	1	Ritchie, D.C., A.S. Harestad, and R. Archibald	1987
Peromyscus maniculatus	Deer mouse (adult)	Glyphosate	NOEL	Injury, general	1.2	1	Ritchie, D.C., A.S. Harestad, and R. Archibald	1987
Peromyscus maniculatus	Deer mouse (adult)	Glyphosate	NOEL	Pregnant females in a population	1.2	1	Ritchie, D.C., A.S. Harestad, and R. Archibald	1987
Peromyscus maniculatus	Deer mouse	Roundup	LOEL	Abundance	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	LOEL	Weight	2.2	1	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	LOEL	Weight	2.2	1	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Abundance	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Weight	2.2	3	Sullivan, T.P.	1990
Peromyscus maniculatus	Deer mouse	Roundup	LOEL	Sex ratio	1.6	48 wk	Sullivan, T.P., and D.S. Sullivan	1981
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Stage	1.6	48 wk	Sullivan, T.P., and D.S. Sullivan	1981
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Stage	1.6	48 wk	Sullivan, T.P., and D.S. Sullivan	1981

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	1.6	80 wk	Sullivan, T.P., and D.S. Sullivan	1981
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	1.6	80 wk	Sullivan, T.P., and D.S. Sullivan	1981
Peromyscus maniculatus	Deer mouse	Glyphosate	NOEL	Abundance	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Glyphosate	NOEL	Pregnant females in a population	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Glyphosate	NOEL	Survival	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Glyphosate	NOEL	Biomass	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Glyphosate	NOEL	Biomass	2.1	5	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Abundance	1.1	2	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Abundance	1.1	3	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Abundance	1.1	3	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Peromyscus maniculatus	Deer mouse	Roundup	LOEL	Reproducing organisms	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and	1997

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
							R.G. Wagner	
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Reproducing organisms	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Population change (change in N/change in time)	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Survival	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Peromyscus maniculatus	Deer mouse	Roundup	NOEL	Population change (change in N/change in time)	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Mus musculus	House mouse (12-14 wk)	Roundup	NOEL	Chromosomal aberrations	1,080	120 hours	Dimitrov, B.D., P.G. Gadeva, D.K. Benova, and M.V. Bineva	2006
Mus musculus	House mouse (10-12 wk)	Roundup	NOEL	Polychromatic cells	200	48 hours	Grisolia, C.K.	2002
Notomys mitchelli	Mitchell's Hopping Mouse	Roundup	NR-ZERO	Mortality	≤ 3,700	33 days	Evans, D.D., and M.J. Batty	1986
Notomys alexis	Spinifex Hopping Mouse	Roundup	NR-ZERO	Mortality	≤ 3,700	33 days	Evans, D.D., and M.J. Batty	1986
	Shrews							
Sorex cinereus	Masked shrew	Vision	LOEL	Abundance	1.3	2	Gagne, N., L. Belanger, and J. Huot	1999
Sorex pacificus	Pacific Shrew	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M.	1998

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
							Newton, J.P. Leeming, and C.L. Chambers	
Sorex sp.	Red-toothed shrew	Glyphosate	LOEL	Abundance	2.1	1	Sullivan, T.P., C. Nowotny, R.A. Lautenschlager, and R.G. Wagner	1998
Sorex sp.	Red-toothed shrew	Roundup	NOEL	Abundance	1.6	11	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Sorex sp.	Red-toothed shrew	Roundup	NOEL	Abundance	2.2	9	Sullivan, T.P., D.S. Sullivan, R.A. Lautenschlager, and R.G. Wagner	1997
Sorex trowbridgii	Trowbridge's Shrew	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M. Newton, J.P. Leeming, and C.L. Chambers	1998
Sorex vagrans	Vagrant Shrew	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M. Newton, J.P. Leeming, and C.L. Chambers	1998
Other Small Rodents								
Sminthopsis macroura	Striped Face Dunnart (Australia)	Roundup	NR-ZERO	Mortality	< 3,700	33 days	Evans, D.D., and M.J. Batty	1986
Tamias townsendii	Townsend's Chipmunk	Glyphosate	LOEL	Abundance	1.3	2	Cole, E.C., W.C. McComb, M. Newton, J.P. Leeming, and C.L. Chambers	1998
Tamias amoenus	Yellow pine chipmunk	Roundup	NOEL	Abundance	1.1	3	Sullivan, T.P., D.S. Sullivan, E.J. Hogue, R.A. Lautenschlager, and R.G. Wagner	1998
Tamias amoenus	Yellow pine chipmunk	Roundup	NOEL	Abundance	1.1	3	Sullivan, T.P., D.S. Sullivan, E.J. Hogue,	1998

Scientific Name	Common Name	Test Substance	Endpoint	Effect	Dose (kg a.e./ha)	Study Time (yr)	Reference	Year
							R.A. Lautenschlager, and R.G. Wagner	

Table D-2: Glyphosate Toxicity to Birds: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Formulation	Age (days)	Concentration (mg/kg)	Study Duration (days)	Type of Exposure	Ref
Anas platyrhynchos	mallard duck	glyphosate	1	> 5,000	8	chemical always present in food	4
Anas platyrhynchos	mallard duck	glyphosate	10	> 5,200	8	chemical always present in food	4
Anas platyrhynchos	mallard duck	glyphosate	14	> 4,640	8	chemical always present in food	5
Colinus virginianus	northern bobwhite	glyphosate	5	> 5,000	8	chemical always present in food	4
Colinus virginianus	northern bobwhite	glyphosate	10	> 5,200	8	chemical always present in food	4
Colinus virginianus	northern bobwhite	glyphosate	14	> 4,640	8	chemical always present in food	5
Coturnix japonica	Japanese quail	Roundup	20	>3,700	5	oral, unreported frequency	6
Median concentration of glyphosate in food that caused 50% mortality in birds: >5000 mg/kg [α]							

NR = not reported.

None of the studies in the EPA database reported whether results were statistically significant.

[a] Since most studies report that the LC_{50} had not been reached with the highest treatment dose, the median dose reported at the end of the table is probably a lower limit on the true LC_{50}.

Table D-3: Glyphosate Toxicity to Birds: Mortality Using LD_{50} as an Endpoint

Scientific Name	Common Name	Formulation	Age (days)	Dose (mg/kg)	Study Duration (days)	Type of Exposure	Ref
Anas platyrhynchos	mallard duck	NR	168	950	21	oral, unreported frequency	4
Colinus virginianus	northern bobwhite	glyphosate	112	2,000	21	oral, unreported frequency	5
Colinus virginianus	northern bobwhite	NR	14	2,850	8	oral, unreported frequency	4
Median dose of glyphosate that caused 50% mortality in birds: 950 mg/kg							

NR = not reported.

None of the studies reported whether results were statistically significant.

Table D-4: Toxicity of Glyphosate to Birds: Effects Other than Mortality

Scientific Name	Common Name	End-point	Effect	Age (days)	Dose	Study Duration	Type of Exposure	Ref
Anas platyrhynchos [a]	mallard duck	LOEL	testosterone reduction	15	3.7 mg/kg [b]	15 days	oral, once daily	7
Anas platyrhynchos	mallard duck	LOEL	histological	15	3.7 mg/kg [b]	15 days	oral, once daily	7
Anas platyrhynchos	mallard duck	NOEL	weight	15	74 mg/kg [b]	15 days	oral, once daily	7
Anas platyrhynchos	mallard duck	NOEL	organ weight	15	74 mg/kg [b]	15 days	oral, once daily	7
Coturnix japonica	Japanese quail	NOEL	mortality	20	1,660 mg/kg [c]	5 days	always in food	6
Anas platyrhynchos	mallard duck	NOEL	reproductive	NR	1,000 ppm	5 days	oral	4
Colinus virginianus	bobwhite quail	NOEL	reproductive	NR	1,000 ppm	5 days	oral	4
Gallus domesticus	chicken	NOEL	hatching success & delay	egg, 0 [d]	18 µg/L	until hatch	dipped once	8
Gallus domesticus	chicken	NOEL	hatching success & delay	egg, 6 [d]	18 µg/L	until hatch	dipped once	8
Gallus domesticus	chicken	NOEL	hatching success & delay	egg,12 [d]	18 µg/L	until hatch	dipped once	8
Gallus domesticus	chicken	NOEL	hatching success & delay	egg,18 [d]	18 µg/L	until hatch	dipped once	8
Reproductive effects observed at 3.7 mg/kg day. No morbidity effects from dipping egg in 18 µg/L solution and no organ weight gain from ingesting 100 mg/kg day.								

NR = not reported.
All of the studies in this table used Roundup as the Chemical Formulation.
[a] This result was statistically significant.
[b] Dose in milligrams chemical per kilogram bodyweight.
[c] Dose in milligrams chemical per kilogram food.
[d] The experimental unit is an "egg", and the number of days since fertilization is reported.

Table D-5: Toxicity of Glyphosate to Honey Bees: Mortality Using an LD_{50} Endpoint

Scientific Name	Common Name	Formulation	Dose (µg/bee)	Study Duration (days)	Endpoint	Exposure Type	Ref
Apis mellifera [a]	honeybee	glyphosate	100	2	LD_{50}	one topical application	5
Apis mellifera [a]	honeybee	glyphosate	100	2	LD_{50}	one oral dose	5
Apis mellifera	honeybee	NR	62	4	LD_{50}	one topical application	4
Apis mellifera	honeybee	NR	50	4	NOEL	one topical application	44

NR = Not reported.
The significance level was not reported.
[a] Two studies are reported in the RED for this result.

Table D-6: Toxicity of Glyphosate to Arachnids and Insects: NOELs for Abundance and Diversity

Scientific Name	Common Name	Effect	Formulation	Concentration kg/ha	Study Duration (days)	Type of Exposure	Ref
Gonatium rubens	dwarf weaver spider	abundance	Roundup	0.13	122	1 application	9
Arachnida	Arachnids[a, b]	abundance	Roundup	0.13	122	1 application	9
Arachnida	Arachnids[a]	abundance	Roundup	0.27	122	1 application	9
Araneae	araneoid spiders	diversity[h]	Roundup	0.27	183	1 application	10
Lepthyphantes tenuis	dwarf weaver spider	abundance	Roundup	0.36	488	1 application	11
Lepthyphantes tenuis	dwarf weaver spider	abundance	Roundup	0.27	92	1 application	9
Insecta	5 insects[c]	abundance	Roundup	0.62	21	2 applications	12
Insecta	5 insects[c]	abundance	Roundup	0.62	35	2 applications	12
Anticarsia gemmatalis	velvetbean caterpillar[d]	abundance	Roundup	0.62	61	1 application	13
Insecta	4 insects[e]	abundance	Roundup	0.62	46	1 application	13
Nezara viridula	stink bug	abundance	Roundup	0.62	61	1 application	13
Pentatomidae	stink bug family	abundance	Roundup	0.62	46	1 application	13
Aphididae	aphid family [f]	abundance	Roundup	0.84	62-82	1 application	14
Oscinella frit	frit fly	abundance	Roundup	1.4	14	1 application	15
Araneae	araneoid spiders	diversity[h]	Roundup	1.1	153	1 application	10
Carabidae	26 ground beetles[g]	abundance	Vision	1.5	770	1 application	16
Carabidae	26 ground beetles[g]	diversity[h]	Vision	1.5	770	1 application	16
Carabidae[i]	ground beetle	abundance	glyphosate	1.2	14	2 applications	17
Carabidae[i]	ground beetle	mortality	glyphosate	1.2	335	1 application	17
Carabidae[i]	ground beetle	appetite	glyphosate	1.2	335	1 application	17
Lepthyphantes tenuis[i]	dwarf weaver spider	abundance	glyphosate	1.6	1	1 application	18
Lepthyphantes tenuis[i]	dwarf weaver spider	abundance	glyphosate	1.6	2	1 application	18
Lepthyphantes tenuis[i]	dwarf weaver spider	abundance	glyphosate	1.6	3	1 application	18
Median NOEL: 0.62 kg/ha							

NR = Not reported..
[a] Exact species were not reported.
[b] This study was duplicated by the author.
[c] The insects included in the study were: *Anticarsia gemmatalis*, *Cerotoma trifurcata*, *Geocoris punctipes*, *Plathypena scabra*, and *Spissistilus festinus*.
[d] This study was performed four times by the author.
[e] The four insects used in this study were: *Spissistilus festinus*, *Empoasca fabae*, *Nezara viridula*, and *Melanoplus sp.*
[f] Only species specifically mentioned was *Aphis glycines* and the author duplicated the study.
[g] The beetles included in the study were: *Agonum affine*, *Agonum cupripenne*, *Agonum retractum*, *Amara angustata*, *Amara confusa*, *Amara obesa*, *Amara quenseli*, *Amara sinuousa*, *Bembidion mutatum*, *Bradycellus semipubescens*, *Calathus gregarious*, *Calosoma calidum*, *Carabus maender*, *Carabus serratus*, *Chlaenius emarginatus*, *Cicindela tranquebarica*, *Cyminidis cribricollis*, *Harpalus nigritarsis*, *Harpalus somnulentus*, *Notiophilus semistriatus*, *Patrobus longicornis*, *Platynus decentis*, *Poecilus lucublandus*, *Pterostichus adstrictus*, *Pterostichus coracinus*, *Scaphinotus bilobus*, *Sphaeroderus canadensis*, *Sphaeroderus stemostomus*, *Synuchus impuntus*.
[h] "Diversity" refers to species rishness.Some studies report this as simply the number of species in the plot, other studies report Shannon or Simpson indices (that incorporate both species richness and evenness).
[i] Study organisms were adults.No other studies reported insect age or lifestage.

Table D-7: Toxicity of Glyphosate to Insects, Arachnids, Gastropods and Arthropods: LOELs for Abundance and Food Consumption

Scientific Name	Common Name	Effect	Formulation	Dose kg/ha	Study Duration (days)	Type of Exposure	Ref
Arachnida	arachnids[a]	abundance	Roundup	0.27	122	1 application	9
Lepthyphantes tenuis	dwarf weaver spider	abundance	Roundup	0.36	122	1 application	11
Aceria tosichella	wheat curl aphid	abundance	Roundup	0.47	10	1 application	19
Stylommatophora	Gastropod order	abundance	Roundup	1.1	56	1 application	20
Carabidae[c]	ground beetle	abundance	glyphosate	1.2	14	2 applications	17
Rhopalosiphum padi	aphid	abundance	Roundup	1.4	14	1 application	15
Philoscia muscorum	Striped woodlouse	food consumption	Roundup	2.1	188	in food[b]	21
Median LOEL: 1.07 kg/ha							

NR = Not reported.
[a] The author reports four studies: two general “arachnid” studies and one specific species studies *Gonatium rubens*.
[b] Leaves of chemically treated birch and cherry trees were fed to insects in the laboratory.
[c] Study organisms were adults.No other studies reported insect age or lifestage.

Table D-8: Glyphosate Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Chemical Formulation	No. of studies	Conc. (mg/L)	Dose Frequency	Duration (days)	Water Flow[b]	Ref
Cnesterodon decemmaculatus	10-spot livebearer	0.89, NR, 15	Roundup	1	74	daily	4	renewal	22
Cyprinus carpio	common carp	NR	glyphosate	1	115	NR	2	NR	23
Cyprinus carpio	common carp	3.6-4.2, 4-5.5, NR	glyphosate	1	620	NR	4	renewal	24
Cyprinus carpio	common carp	3.6-4.2, 4-5.5, NR	glyphosate	1	645	NR	2	renewal	24
Cyprinus carpio	common carp	3-5, NR, NR	Roundup	1	3.1	once	2	static	25
Cyprinus carpio	common carp	3-5, NR, NR	Roundup	1	3.1	once	4	static	25
Cyprinus carpio	common carp	3-5, NR, NR	Roundup	1	3.4	once	1	static	25
Ictalurus punctatus	channel catfish	5.1-7.6, NR, NR	Roundup	1	3.6	daily	4	renewal	26
Lepomis macrochirus	bluegill	5.1-7.6, NR, NR	Roundup	1	3.3	daily	4	renewal	26
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	MON 8709	4	18–65	once	1	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	technical	5	26-380	once	1	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	Vision	5	13–26	once	1	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	MON 8709	4	18–40	once	2	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	technical	5	14-245	once	2	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	Vision	5	13–24	once	2	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	MON 8709	4	18–36	once	3	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	technical	5	14-190	once	3	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	Vision	5	13–24	once	3	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	MON 8709	4	18–36	once	4	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	technical	5	14-190	once	4	static	27
Oncorhynchus gorbuscha	pink salmon	4.3, 0.5, 76	Vision	5	10–24	once	4	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	MON 8709	3	19–46	once	1	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	technical	4	16-202	once	1	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	Vision	4	13–23	once	1	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	MON 8709	3	19–43	once	2	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	technical	4	13-178	once	2	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	Vision	4	9-20	once	2	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	MON 8709	3	17–43	once	3	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	technical	4	10-157	once	3	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	Vision	4	8–18	once	3	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	MON 8709	3	17–43	once	4	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	technical	4	10-148	once	4	static	27
Oncorhynchus keta	chum salmon	4.3, 0.5, 76	Vision	4	8–15	once	4	static	27

Table D-8 (cont.): Glyphosate Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Formulation	No. of studies	Conc. (mg/L)	Dose Frequency	Duration (days)	Water Flow[b]	Ref
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	MON 8709	4	18–44	once	1	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	technical	4	40–210	once	1	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	Vision	5	10–38	once	1	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	MON 8709	4	18–42	once	2	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	technical	5	27-205	once	2	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	Vision	5	10–28	once	2	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	MON 8709	4	18–42	once	3	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	technical	5	27-182	once	3	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	Vision	5	9.6-26	once	3	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	Roundup		16	once	4	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	MON 8709	4	19-41	once	4	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	technical	5	27-174	once	4	static	27
Oncorhynchus kisutch	coho salmon	4.3, 0.5, 76	Vision	5	9.6-24	once	4	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	MON 8709	4	23-65	once	1	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	technical	5	21-220	once	1	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	technical	4	32-220	once	1	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	Vision	5	13-24	once	1	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	MON 8709	4	15-46	once	2	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	technical	5	11-220	once	2	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	Vision	5	13-24	once	2	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	MON 8709	4	13-36	once	3	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	technical	5	11-220	once	3	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	Vision	5	11-24	once	3	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, NR	Roundup	3	11-19	once	4	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, NR	Roundup	2	16-19	once	4	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	MON8709	4	13-36	once	4	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, NR	technical	5	10-197	once	4	static	27
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	Vision	1	7.7	once	4	renewal	28
Oncorhynchus mykiss	rainbow trout	4.3, 0.5, 76	Vision	1	10-24	once	4	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	MON 8709	4	24-62	once	1	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	technical	5	24-220	once	1	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Vision	5	13-30	once	1	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	MON8709	4	24-59	once	2	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Technical	5	22-220	once	2	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Vision	5	13-24	once	2	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	MON8709	4	24-54	once	3	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	technical	5	22-211	once	3	static	27

Table D-8 (cont.): Glyphosate Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Formulation[a]	No. of studies	Conc. Range (mg/L)	Dose Frequency	Duration (days)	Water Flow[b]	Ref
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Vision	5	13-24	once	3	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Roundup	1	15	once	4	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	MON 8709	4	24-50	once	4	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	technical	5	19-211	once	4	static	27
Oncorhynchus tshawytscha	chinook salmon	4.3, 0.5, 76	Vision	5	13–24	once	4	static	27
Procambarus sp.	crawfish	NR	Roundup	1	16,000	daily	4	renewal	26
Tilapia nilotica	Nile tilapia	3, NR, NR	Roundup	1	2.3	once	1	static	25
Tilapia nilotica	Nile tilapia	3, NR, NR	Roundup	1	2.3	once	2	static	25
Tilapia nilotica	Nile tilapia	3-5, NR, NR	Roundup	1	2.3	once	4	static	25
Median dose that caused 50% mortality in fish: 24.45 mg/L									

NR = not reported.

An additional column has been added to describe the number of studies represented by a given row.For example, the first pink salmon entry reports an LC_{50} of 17.78-65.20 mg/L.This range represents 4 studies (two of which have LC_{50}s that fall in this range.

All of the above studies used freshwater and were performed in the laboratory.

[a] "Technical" means technical grade glyphosate at 88-95%."MON 8709" means that this is a Monsanto product.When a product is first registered, but before it has a product name it is given the designation "MON" in addition to an identification number.

[b] "Flow" means that the chemical was flowed through the chamber.

Table D-9: Glyphosate Toxicity to Fish: Effects Other than Mortality

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Formulation	Endpoint	Effect	Conc. (mg/L)	Dose Frequency	Duration (days)	Water Flow[a]	Ref
Oncorhynchus mykiss	rainbow trout	14.7, NR, NR	Roundup	LOEC	physiology	0.74	once	NR	direct	29
Oncorhynchus mykiss	rainbow trout	14.7, NR, NR	Roundup	LOEC	avoidance	7.4	once	0.021	static	29
Cyprinus carpio	common carp	3-5, NR, NR	Roundup	NOEC	multiple	1.7	once	4	static	25
Tilapia nilotica	Nile tilapia	3-5, NR, NR	Roundup	NOEC	multiple	0.31	once	4	static	25
Oncorhynchus mykiss	rainbow trout	11.5, NR, NR	glyphosate	NOEC	biochemical	0.11	daily	7	renewal	30
Oncorhynchus mykiss	rainbow trout	14.7, 32.7, NR	Roundup	NOEC	physiology	0.07	once	NR	direct	29
Oncorhynchus mykiss	rainbow trout	14.7, 32.7, NR	Roundup	NOEC	avoidance	0.74	once	0.021	static	29
Oncorhynchus mykiss[b]	rainbow trout	33.2, NR, NR	Vision	NOEC	feeding	0.03	constant	61	flow	28
Median LOEL in fish: 4.1 mg/L										
Median NOEC/NOEL in fish: 0.11 mg/L										

NR = not reported.

[a] "Flow" means that the chemical was flowed through the chamber."Direct" means that the chemical was directly applied to the organism.

[b] Author repeated the study twice.

Table D-10: Glyphosate Toxicity to Amphibians: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Size (g)	Formulation	Water Flow	Conc. (mg/L)	Duration (days)	Dose Frequency	Ref
Bufo americanus[a]	American toad	NR	Roundup	renewal	1.9	16	every 4 days	31
Bufo americanus[b]	American toad	NR	Roundup Original	static	9.6–19	4	once	32
Crinia insignifera	frog	NR	glyphosate IPA	renewal	466	2	daily	33
Crinia insignifera	frog	0.011	glyphosate	renewal	72	3	daily	34
Crinia insignifera[c]	frog	NR	NR	static	78	4	once	4
Crinia insignifera[d]	frog	NR	Roundup 360	renewal	29	4	daily	34
Crinia insignifera[d]	frog	NR	Roundup 360	renewal	38	2	daily	34
Crinia insignifera	frog	NR	Roundup Biactive	renewal	494	2	daily	33
Crinia insignifera	frog	0.011	Roundup	renewal	3.6	2	daily	33
Heleioporus eyrei	moaning frog	0.011	glyphosate IPA	renewal	373	2	daily	33
Heleioporus eyrei	moaning frog	0.058	Roundup Biactive	renewal	427	2	daily	33
Heleioporus eyrei	moaning frog	0.058	Roundup	renewal	6.3	2	daily	33
Hyla versicolor[a]	gray tree frog	0.058	Roundup	renewal	1.0	16	every 4 days	31
Limnodynastes dorsalis	western banjo frog	NR	glyphosate IPA	renewal	400	2	daily	33
Limnodynastes dorsalis	western banjo frog	0.021	Roundup Biactive	renewal	400	2	daily	33
Limnodynastes dorsalis	western banjo frog	0.021	Roundup	renewal	3	2	daily	33

Litoria moorei	western green frog	0.021	glyphosate	renewal	81	2	daily	33
Litoria moorei	western green frog	0.017	glyphosate IPA	renewal	343	2	daily	33
Litoria moorei	western green frog	0.017	glyphosate	renewal	111	4	daily	34
Litoria moorei	western green frog	NR	Roundup 360	renewal	5.7	4	daily	34
Litoria moorei	western green frog	NR	Roundup Biactive	renewal	328	2	daily	33
Litoria moorei	western green frog	0.017	Roundup	renewal	2.9	2	daily	33
Rana catesbeiana[a]	bullfrog	NR	Roundup	renewal	1.5	16	every 4 days	31
Rana clamitans	green frog	NR	Glyphos AU	static	21	4	once	32
Rana clamitans	green frog	NR	Glyphos BIO	static	43	4	once	32
Rana clamitans	green frog	NR	glyphosate	static	39	4	once	32
Rana clamitans[a]	green frog	NR	Roundup	renewal	1.6	16	every 4 days	31
Rana clamitans	green frog	NR	Roundup Biactive	static	43	4	once	32
Rana clamitans[b]	green frog	NR	Roundup Original	static	4.8–17	4	once	32
Rana clamitans	green frog	NR	Roundup Transorb	static	5.3	4	once	32
Rana clamitans[c]	green frog	NR	Vision	static	2.7–4.3	4	once	35
Rana pipiens[a]	leopard frog	NR	Roundup	renewal	1.8	16	every 4 days	31
Rana pipiens[b]	leopard frog	NR	Roundup Original	static	6.8–15	4	once	32
Rana pipiens[b]	leopard frog	NR	Vision	static	4.3–12	4	once	35
Rana sylvatica[b]	wood frog	NR	Roundup	renewal	0.41–0.98	16	every 4 days	31
Rana sylvatica[b]	wood frog	NR	Roundup Original	static	12–19	4	once	32
Median ROUNDUP or VISION dose range that caused 50%mortality in amphibians: 4.3–12 mg/L								
Median GLYPHOSATE or ROUNDUP BIACTIVE dose that caused 50%mortality in amphibians: 220 mg/L								

NR = not reported.IPA = Isopropylamine salt.

All of the above studies used freshwater.

Organism age was not reported because all tadpoles were in Gosner Stage 25 characterized by a fully formed tadpole with no limbs, absent external gills, and full formed feeding parts and mouth.

None of the studies in the EPA database reported whether results were statistically significant.

[a] Author repeated the study once.

[b] The range reported here represents only two studies, one study representing the minimum LC_{50} in the range and the other representing the maximum LC_{50} in the range.

[c] The age of this organism was reported to be 3 days old.Gosner stage was not reported.

[d] Organisms were collected from the field.

Table D-11: Glyphosate Toxicity to Amphibians: Mortality with LC_{100} Endpoints

Scientific Name	Common Name	Size (g)	End-point	Formulation	Water Flow	Conc. (mg/L)	Duration (days)	Dose Frequency	Ref
Crinia insignifera[c]	frog	NR	LC_{100}	glyphosate	renewal	135	4	daily	34
Litoria moorei[c]	western green frog	NR	LC_{100}	glyphosate	renewal	180	1	daily	34
Bufo americanus[b]	American toad	NR	LC_{100}	Roundup	renewal	3.7	16	every 4 days	31
Hyla versicolor[a]	gray tree frog	NR	LC_{100}	Roundup	renewal	3.7	16	every 4 days	31
Rana catesbeiana[b]	bullfrog	NR	LC_{100}	Roundup	renewal	3.7	16	every 4 days	31
Rana clamitans[a]	green frog	NR	LC_{100}	Roundup	renewal	3.7	16	every 4 days	31
Rana pipiens[b]	leopard frog	NR	LC_{100}	Roundup	renewal	3.7	16	every 4 days	31
Rana sylvatica[b]	wood frog	NR	LC_{100}	Roundup	renewal	3.7	1	every 4 days	31
Crinia insignifera[c]	frog	NR	LC_{100}	Roundup 360	renewal	67	4	daily	34
Crinia insignifera[c]	frog	NR	LC_{100}	Roundup 360	renewal	133	2	daily	34
Litoria moorei[c]	western green frog	NR	LC_{100}	Roundup 360	renewal	133	3	daily	34
Litoria moorei[a,c]	western green frog	NR	LC_{100}	Roundup 360	renewal	13–33	1	daily	34
Rana clamitans	green frog	NR	LC_{100}	Vision	static	8.1	1	once	10
Rana clamitans	green frog	NR	LC_{100}	Vision	static	9.3	7	once	10
Rana pipiens[a]	leopard frog	NR	LC_{100}	Vision	static	8.1–18	4	once	10
Median FORMULATION dose that caused 100% mortality in amphibians, respectively: 9.3 mg/L									
Median GLYPHOSATE dose that caused 100% mortality in amphibians, respectively: 157 mg/L									

NR = not reported.IPA = Isopropylamine salt.
All of the above studies used freshwater.
Organism age was not reported because alll tadpoles were in Gosner Stage 25 characterized by a fully formed tadpole with no limbs, absent external gills, and full formed feeding parts and mouth.
None of the studies in the EPA database reported whether results were statistically significant.
[a] The range reported here represents only two studies, one study representing the minimum LC_{50} in the range and the other representing the maximum LC_{50} in the range.
[b] The author repeated the study once.
[c] Organisms were collected from the field.

Table D-12: Glyphosate Toxicity to Amphibians: Effects Other than Mortality

Scientific Name	Common Name	Size (g)	End-point	Effect[a]	Formulation	Water Flow	Conc. (mg/L)	Duration (days)	Dose Frequency	Ref
Bufo americanus	American toad	0.056	LOEC	growth	Roundup	renewal	1.5	16	every 4 days	36
Rana cascadae	Cascades Frog	NR	LOEC	development	Roundup	renewal	0.71	27	every 7 days	37
Rana catesbeiana	Bullfrog	0.023	LOEC	growth	Roundup	renewal	1.5	16	every 4 days	36
Rana clamitans	Green frog	NR	LOEC	growth	Roundup Original	static	0.60	166	once	32
Rana clamitans	Green frog	NR	LOEC	development	Roundup Original	static	0.60	166	once	32
Rana clamitans	Green frog	NR	LOEC	morphology	Roundup Original	static	0.60	166	once	32
Rana clamitans	Green frog	NR	LOEC	growth	Roundup Transorb	static	0.60	166	once	32
Rana clamitans	Green frog	NR	LOEC	development	Roundup Transorb	static	0.60	166	once	32
Rana clamitans	Green frog	NR	LOEC	morphology	Roundup Transorb	static	1.8	166	once	32
Rana clamitans	Green frog	0.028	LOEC	growth	Roundup	renewal	1.5	16	every 4 days	36
Bufo americanus	American toad	0.056	NOEC	growth	Roundup	renewal	0.74	16	every 4 days	36
Hyla versicolor	Gray tree frog	0.073	NOEC	growth	Roundup	renewal	1.5	16	every 4 days	36
Rana catesbeiana	Bullfrog	0.023	NOEC	growth	Roundup	renewal	0.74	16	every 4 days	36
Rana clamitans	Green frog	NR	NOEC	growth	glyphosate	static	1.8	166	once	32
Rana clamitans	Green frog	NR	NOEC	development	glyphosate	static	1.8	166	once	32
Rana clamitans	Green frog	NR	NOEC	morphology	glyphosate	static	1.8	166	once	32
Rana clamitans	Green frog	NR	NOEC	genetic	glyphosate	static	1.8	120	once	32
Rana clamitans[b]	Green frog	NR	NOEC	genetic	Roundup Original	static	1.8	120	once	32
Rana clamitans	Green frog	NR	NOEC	morphology	Roundup Transorb	static	0.60	166	once	32
Rana clamitans	Green frog	0.028	NOEC	growth	Roundup	renewal	0.74	16	every 4 days	36
Rana clamitans[c]	Green frog	NR	NOEC	growth	Vision	static	14–18	56	once	35
Rana pipiens	Leopard frog	0.095	NOEC	growth	Roundup	renewal	1.5	16	every 4 days	36
Rana pipiens	Leopard frog	NR	NOEC	growth	Vision	static	14	1	once	35
Rana pipiens	Leopard frog	NR	NOEC	growth	Vision	static	18	56	once	35
Median growth or development LOEL: 0.71 mg/L										
Median growth or development NOEL: 1.8 mg/L										

NR = not reported.IPA = Isopropylamine salt.
All of the above studies used freshwater.
Organism age was not reported because alll tadpoles were in Gosner Stage 25 characterized by a fully formed tadpole with no limbs, absent external gills, and full formed feeding parts and mouth.
None of the studies in the EPA database reported whether results were statistically significant.
[a] “Growth” refers to either a change in the dimensions or weight of an organism.“Development” refers to tissue development in growing progeny.“Morphology” refers to the structure or form of the organism.“Avoidance” refers to organisms altering their behavior to avoid the chemical.“Genetic” refers to changes in the genetic makeup of cells or tissues.
[b] The author repeated the study once.
[c] The range reported here represents only two studies, one study representing the minimum LC_{50} in the range and the other representing the maximum LC_{50} in the range.

Table D-13: Glyphosate Toxicity to Aquatic Invertebrates: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Age	Formulation[a]	Conc. (mg/L)	Duration (days)	Ref
Ceriodaphnia dubia	water flea	<24 hr	Roundup	4.4	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	5.3	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	20	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	22	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	26	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	34	2	38
Ceriodaphnia dubia	water flea	<24 hr	Roundup	79	2	38
Daphnia magna	water flea	1st instar	glyphosate	780	NR	4
Chironomus plumosus	midge	NR	glyphosate	55	2	4
Nephelopsis obscura	leech	adult	Rodeo	857	4	39
Utterbackia imbecillis	Ppaper pondshell	mature glochidia	Roundup	14	1	40
Median dose that caused 50% mortality: 26 mg/L						

Table D-14: Glyphosate Toxicity to Aquatic Invertebrates: EC_{50} Endpoints

Scientific Name	Common Name	Age	Chemical Formulation[a]	Conc. (mg/L)	Effect	Duration (days)	Ref
Bosmina sp.	water flea	NR	Vision	1.5	population decrease	11	35
Chironomus riparius	midge	4th instar	Rodeo	4,400	response time increase	1	41
Chironomus riparius	midge	4th instar	Rodeo	970	response time increase	2	39
Chironomus riparius	midge	4th instar	Rodeo	4,150	response time increase	2	41
Cladocera	water flea order	NR	Vision	0.17	population decrease	7	35
Cladocera	water flea order	NR	Vision	1.4	population decrease	11	35
Copepoda	copepod subclass	NR	Vision	1.6	population decrease	4	35
Copepoda	copepod subclass	NR	Vision	0.43	population decrease	7	35
Copepoda	copepod subclass	NR	Vision	0.71	population decrease	7	35
Copepoda	copepod subclass	NR	Vision	0.74	population decrease	7	35
Daphnia magna	water flea	1st instar	Rodeo	404	response time increase	2	39
Daphnia pulex	water flea	mature	Roundup	5.9	response time increase	2	42
Diaphanosoma sp	water Flea	NR	Vision	0.32	population decrease	7	35
Hyalella azteca	scud	ADULT	Rodeo	540	response time increase	4	39
Rotifera	rotifer phylum	NR	Vision	5.3	population decrease	14	35

Median EC_{50} for ROUNDUP/VISION for population decreases or response time increases: 1.1 mg/L
Median EC_{50} for RODEO for population decreases or response time increases: 970 mg/L

Table D-15: Glyphosate Toxicity to Aquatic Invertebrates: NOEC Endpoint

Scientific Name	Common Name	Age	Chemical Formulation[a]	Conc. (mg/L)	Effect	Duration (days)	Ref
Ichthyophthirius multifilis	ciliate	NR	glyphosate	2,540	mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	glyphosate	1,270	mortality	1	43
Daphnia magna	water flea	NR	glyphosate	50-90	unknown	NR	44
Tetrahymena thermophila	ciliate protozoa	NR	Roundup	29	mortality	1	43
Tetrahymena thermophila	ciliate protozoa	NR	Roundup	57	mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	29	mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	15	mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	7	mortality	1	43
Dytiscus	diving beetle	NR	Vision	0.96	mortality	23	45
Utterbackia imbecillis	paper pondshell	NR	Roundup	3.7	mortality	1	40
Simocephalus vetulus	water flea	1	Vision	1.5	mortality	8	46

Median NOEC for ROUNDUP/VISION: 11 mg/L
Median NOEC for GLYPHOSATE: 1,270 mg/L

Table D-16: Glyphosate Toxicity to Aquatic Invertebrates: LOEC Endpoint

Scientific Name	Common Name	Age (days)	Chemical Formulation[a]	Conc. (mg/L)	Effect	Duration (days)	Ref
Ichthyophthirius multifilis	ciliate	NR	glyphosate	2,540	Mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	glyphosate	5,070	Mortality	1	43
Simocephalus vetulus	water flea	10	Vision	0.75	Mortality	8	46
Ichthyophthirius multifilis	ciliate	NR	Roundup	57	Mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	0.85	Mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	29	Mortality	1	43
Ichthyophthirius multifilis	ciliate	NR	Roundup	15	Mortality	1	43
Tetrahymena thermophila	ciliate protozoa	NR	Roundup	57	Mortality	1	43
Tetrahymena thermophila	ciliate protozoa	NR	Roundup	117	Mortality	1	43
Median LOEC for ROUNDUP/VISION: 29 mg/L							
Median LOEC for GLYPHOSATE: 3,800 mg/L							

1.4 Appendix E: Toxicity of Triclopyr to Animals and Other Organisms

Table E-2: Triclopyr Toxicity to Birds: Mortality

Scientific Name	Common Name	Age (days)	Formulation	Concentration[a] or dose (mg/kg)	Study Duration (days)	Endpoint	Type of Exposure[b]	Ref
Anas platyrhynchos	mallard duck	14	triclopyr acid	1,480	14	LD_{50}	oral	44
Anas platyrhynchos	mallard duck	14	triclopyr TEA	> 4,660	8	LC_{50}	oral	44
Anas platyrhynchos[c]	mallard duck	NR	triclopyr acid	1,700	14	LD_{50}	diet	44
Anas platyrhynchos[c]	mallard duck	NR	triclopyr acid	5,620	8	LC_{50}	diet	44
Anas platyrhynchos[c]	mallard duck	NR	triclopyr BEE	>6,700	8	LC_{50}	diet	44
Poephila guttata	Zebra finch	NR	Garlon 4	1,920	5	LD_{50}	diet	44
Cortunix japonica	Japanese quail	NR	triclopyr acid	3,270	8	LC_{50}	diet	44
Colinus virginianus	northern bobwhite[c]	NR	triclopyr BEE	3,740	8	LC_{50}	diet	44
Colinus virginianus	northern bobwhite	14	triclopyr acid	2,930	8	LC_{50}	diet	44
Colinus virginianus	northern bobwhite	NR	triclopyr BEE	6,040	8	LC_{50}	diet	44
Colinus virginianus	northern bobwhite	14	triclopyr TEA	>5,380	8	LC_{50}	diet	44
Colinus virginianus	northern bobwhite	210	triclopyr BEE	610	14	LD_{50}	oral	44
Colinus virginianus	northern bobwhite	210	triclopyr BEE	510	21	LD_{50}	oral	47
Colinus virginianus[c]	northern bobwhite	NR	triclopyr BEE	>3,880	8	LC_{50}	diet	44
Median LD_{50} for birds: 1,698 mg/kg								
Median LC_{50} for birds: >5,401 mg/kg								

NR = Not Reported ; TEA = Triethylamine sal; BEE = Butoxyethyl ester
Statistical significance was not reported.
[a] LC_{50} = concentration in mg chemical per kg food; LD_{50} = dose in mg chemical per kg organism body weight. An attempt was made to convert all concentrations to units of "acid equivalents", however, some studies were not diligent in reporting units.
[b] Dose frequency is not reported.
[c] There are two studies that yield this result.

Table E-3: Triclopyr Toxicity to Birds: Sub-lethal Effects

Scientific Name	Common Name	Age (days)	Formulation	Concentration (mg/kg food)	Study Duration	End-point	Effect	Exposure[a]	Ref
Poephila guttata	zebra finch	NR	Garlon 4	500 mg/kg	29 days	LOEC	weight loss	diet	44
Anas platyrhynchos	mallard duck	NR	triclopyr acid	100 mg/kg	29 days	NOEC	offspring survivorship	diet	47
Anas platyrhynchos[b]	mallard duck	NR	triclopyr acid	200 mg/kg	29 days	LOEC	offspring survivorship	diet	47
Colinus virginianus	northern bobwhite	NR	triclopyr acid	500 mg/kg	29 days	LOEC	egg thickness	diet	47
Poephila guttata	zebra finch	NR	Garlon 4	150 mg/kg	29 days	NOEC	weight loss	diet	44
Colinus virginianus	northern bobwhite	NR	triclopyr acid	500 mg/kg	29 days	NOEC	egg thickness	diet	47

NR = Not Reported. Statistical significance was not reported.
[a] Dose frequency is not reported.
[b] There are two studies by different authors that yield this result.

Table E-4. Toxicity of Triclopyr to Honey Bees: Mortality Using an LD_{50} Endpoint

Scientific Name	Common Name	Age (days)	Formulation	Dose (µg/bee)	Study Duration (days)	Exposure Type	Ref
Apis mellifera	honeybee	1-7 days	NR	>100	2	once, topically	47
Apis mellifera	honeybee	NR	NR	> 25	2	once, topically	4
Apis mellifera[a]	honeybee	NR	NR	> 100	2	once, topically	47

NR = Not Reported. Statistical significance was not reported.
[a] There are two studies that yield this result.

Table E-5. Triclopyr Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Formulation	Water Flow	Conc. [mg/L]	Duration (days)	Dose Frequency	Ref
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 4	static	1.56	1	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 4	static	1.56	2	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 4	static	1.56	3	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 4	static	1.56	4	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 4	static	1.56	1	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 4	static	1.34	2	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 4	static	1.26	3	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 4	static	1.26	4	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 4	static	1.85	1	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 4	static	1.11	2	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 4	static	1.04	3	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 4	static	1.04	4	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 4	static	3.04	1	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 4	static	2.15	2	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 4	static	2.00	3	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 4	static	2.00	4	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 4	static	3.12	1	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 4	static	2.00	2	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 4	static	2.00	3	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 4	static	2.00	4	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	Garlon 4	static	1.41	1	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	Garlon 4	static	0.96	2	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	Garlon 4	static	0.89	3	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	Garlon 4	static	0.89	4	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr BEE	static	0.74	1	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr BEE	static	0.74	2	once	48

Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr BEE	static	0.74	3	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr BEE	static	0.74	4	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr BEE	static	0.30	1	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr BEE	static	0.22	2	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr BEE	static	0.22	3	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr BEE	static	0.22	4	once	48

NR = Not Reported : TEA = Triethylamine salt: BEE = Butoxyethyl ester; Statistical significance not reported.

Table E-5 (Cont.): Triclopyr Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Chemical Formulation	Water Flow	Conc. (mg/L)	Duration (days)	Dose Frequency	Ref
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr BEE	static	0.37	1	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr BEE	static	0.30	2	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr BEE	static	0.30	3	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr BEE	static	0.30	4	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr BEE	static	0.82	1	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr BEE	static	0.82	2	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr BEE	static	0.82	3	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr BEE	static	0.82	4	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr BEE	static	1.2	1	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr BEE	static	0.82	2	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr BEE	static	0.82	3	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr BEE	static	0.82	4	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr BEE	static	0.45	1	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr BEE	static	0.37	2	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr BEE	static	0.37	3	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr BEE	static	0.37	4	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 3	static	351	1	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 3	static	336	2	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 3	static	336	3	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	Garlon 3	static	327	4	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 3	static	223	1	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 3	static	205	2	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 3	static	194	3	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	Garlon 3	static	188	4	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 3	static	249	1	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 3	static	219	2	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 3	static	219	3	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	Garlon 3	static	219	4	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 3	static	322	1	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 3	static	307	2	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 3	static	296	3	once	48

Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	Garlon 3	static	296	4	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr	static	9.9	1	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr	static	9.6	2	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr	static	9.6	3	once	48
Oncorhynchus kisutch	coho or silver salmon	4.0, 0.5, 30	triclopyr	static	9.6	4	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr	static	7.9	1	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr	static	7.5	2	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr	static	7.5	3	once	48
Oncorhynchus keta	chum salmon	4.5, 0.5, 30	triclopyr	static	7.5	4	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr	static	7.8	1	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr	static	7.5	2	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr	static	7.5	3	once	48
Oncorhynchus nerka	sockeye salmon	3.9, 0.5, 45	triclopyr	static	7.5	4	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr	static	8.4	1	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr	static	7.8	2	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr	static	7.6	3	once	48
Oncorhynchus mykiss	rainbow trout	4.1, 0.7, 30	triclopyr	static	7.5	4	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr	static	9.7	1	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr	static	9.7	2	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr	static	9.7	3	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	triclopyr	static	9.7	4	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr	static	13.3	1	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr	static	8.8	2	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr	static	6.1	3	once	48
Oncorhynchus gorbuscha	pink salmon	3.5, 0.2, 38	triclopyr	static	5.3	4	once	48

NR = Not Reported; TEA = Triethylamine salt; BEE = Butoxyethyl ester; Statistical significance not reported.

Table E-5 (Cont.): Triclopyr Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Chemical Formulation	Water Flow[b]	Conc. [mg/L]	Duration (days)	Dose Frequency	Ref
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 3	static	333	1	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 3	static	220	2	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 3	static	200	3	once	48
Oncorhynchus tshawytscha	chinook salmon	6.8, 2.7, 105	Garlon 3	static	194	4	once	48
Oncorhynchus mykiss	rainbow trout	NR	triclopyr	static	117	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR	triclopyr	static	148	4	once	47
Oncorhynchus kisutch	coho salmon	8.4, 6.1, juv.	triclopyr BEE	static	1.6	4	once	49
Oncorhynchus mykiss	rainbow trout	3.4, 0.29, fry	triclopyr BEE	static	1.6	4	once	49
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	triclopyr TEA	flow through	286	4	once	47
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	triclopyr TEA	flow through	83	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR, NR, NR	triclopyr TEA	flow through	416	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR, NR, NR	triclopyr TEA	flow through	162	4	once	47
Pimephales promelas	fathead minnow	NR, NR, NR	triclopyr TEA	flow through	441	4	once	47
Pimephales promelas	fathead minnow	NR, NR, NR	triclopyr TEA	flow through	176	4	once	47
Pimephales promelas	fathead minnow	NR, NR, NR	triclopyr TEA	flow through	90	4	once	47
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	triclopyr BEE	flow through	0.45	4	once	47
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	triclopyr BEE	flow through	0.93	4	once	47
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	triclopyr BEE	flow through	0.35-1.22	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR, NR, NR	triclopyr BEE	flow through	1.1	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR, NR, NR	triclopyr BEE	flow through	0.25	4	once	47
Lepomi smacrochirus	bluegill sunfish	NR, NR, NR	triclopyr BEE	flow through	0.60	4	once	47
Pimephales promelas	fathead minnow	NR, NR, NR	triclopyr BEE	flow through	1.67	4	once	47
Pimephales promelas	fathead minnow	NR, NR, NR	triclopyr BEE	flow through	1.6	4	once	47
Oncorhynchus kisutch	coho salmon	NR, NR, yolk fry	triclopyr BEE	flow through	0.33-0.34	4	once	47
Oncorhynchus mykiss	rainbow trout	3.4, 0.33, fry	Garlon 3	static	282	4	once	50
Oncorhynchus mykiss	rainbow trout	4.0, NR, fry	Garlon 4	static	1.8	4	once	50
Oncorhynchus mykiss	rainbow trout	3-5, NR, NR	Garlon 4	flow through	16.7	0.042	constant	50
Oncorhynchus mykiss	rainbow trout	3-5, NR, NR	Garlon 4	flow through	1.4	0.25	constant	50
Oncorhynchus mykiss	rainbow trout	3-5, NR, NR	Garlon 4	flow through	0.59	1	constant	50
Oncorhynchus nerka	sockeye salmon	7.1, 4.5, juv	triclopyr BEE	static	1.04	4	once	49
Oncorhynchus nerka	sockeye salmon	2.9, 0.22, fry	triclopyr BEE	static	0.89	4	once	49
Oncorhynchus tshawytscha	chinook salmon	3-5, NR, NR	Garlon 4	flow through	26	0.042	constant	50
Oncorhynchus tshawytscha	chinook salmon	3-5, NR, NR	Garlon 4	flow through	3.5	0.25	constant	50
Oncorhynchus tshawytscha	chinook salmon	3-5, NR, NR	Garlon 4	flow through	1.3	1	constant	50
Pimephales promelas	fathead minnow	1.6-3.1,0.22, NR	NR	static	173	4	once	50
Pimephales promelas	fathead minnow	1.6-3.1,0.22, NR	NR	flow through	85	4	constant	50
Pimephales promelas	fathead minnow	1.6-3.1,0.22, NR	NR	flow through	71	8	constant	50
Median concentration dose that caused 50% mortality in fish for triclopyr BEE and TEA respectively: 0.82 mg/L and 249 mg/L								

NR = Not Reported; TEA = Triethylamine salt; BEE = Butoxyethyl ester; Statistical significance not reported.
[a] "Flow" means that a solution of the chemical at the specified concentration was flowing continuously through the chamber during the study time.

Table E-6: Chronic Triclopyr Toxicity to Fish

Scientific Name	Common Name	Age, Length (cm)	Formulation	Concentration (mg/L)	Study Duration (days)	End-point	Effect	Type of Exposure	Ref
Pimephales promelas	fathead minnow	NR	triclopyr TEA	<162	NR	LOEC	stunted length	NR	47
Oncorhynchus mykiss[a]	rainbow trout	NR	NR	0.24-0.32	4	LOEC	lethargy	NR	51
Oncorhynchus mykiss[a]	rainbow trout	NR	NR	0.074	4	LOEC	hypersensitive	NR	51
Oncorhynchus mykiss[a]	rainbow trout	juv. 4.8	Garlon 3A	141	1	LOEC	behavior	constant	4
Oncorhynchus mykiss[a]	rainbow trout	juv. 4.8	Garlon 3A	564	0.41	LOEC	avoidance	constant	4
Oncorhynchus mykiss[a]	rainbow trout	juv, 4.8	Garlon 4	0.45	1	LOEC	behavior	constant	4
Oncorhynchus mykiss[a]	rainbow trout	juv, 4.8	Garlon 4	14.2	0.41	LOEC	avoidance	constant	4
Pimephales promelas[a]	fathead minnow	fry	triclopyr TEA	178	28	LOEC	egg-fry survival	constant	52
Pimephales promelas[a]	fathead minnow	juv	triclopyr TEA	114	28	LOEC	reduced growth	constant	52
Pimephales promelas	fathead minnow	NR	triclopyr TEA	>104	NR	NOEC	stunted length	NR	47
Median LOEC for chronic fish toxicity: 14.2 mg/L									

NR = Not Reported; TEA = Triethylamine salt; Statistical significance was not reported.
juv = juvenile organism
[a] Experiments were performed in "flow through" chambers.

Table E-7: Triclopyr Toxicity to Amphibians

Scientific Name	Common Name	Formulation	Age (days)	Concentration (mg/L)	Duration (days)	End-point	Effect	Ref
Xenopus laevis	African claw frog	Garlon 3A	embryo	162	4[a]	LC_{50}	mortality	53
Xenopus laevis	African claw frog	Garlon 4	embryo	9.3	4[a]	LC_{50}	mortality	53
Rana catesbeiana	bullfrog	triclopyr acid	0 dph	2.4	2[b]	LC_{100}	mortality	54
Rana clamitans	green frog	triclopyr acid	0 dph	2.4	2[b]	LC_{100}	mortality	54
Rana pipiens	leopard frog	triclopyr acid	0 dph	2.4	2[b]	LOEC	temporarily unresponsive to prodding	54
Rana catesbeiana	bullfrog	triclopyr acid	0 dph	1.2	2[b]	LOEC	temporarily unresponsive to prodding	54
Rana clamitans	green frog	triclopyr acid	0 dph	1.2	2[b]	LOEC	temporarily unresponsive to prodding	54

NR = not reported; dph = days post hatch.
[a] Constant exposure in Petri dish.
[b] Constant exposure in 1L beaker with aerated river water

Table E-8: Triclopyr Toxicity to Aquatic Invertebrates

Scientific Name	Common Name	Formulation	End-point	Concentration (mg/L)	Study Duration (days)	Type of Exposure	Effect	Ref
Daphnia magna	waterflea	triclopyr acid	LC_{50}	133	NR	NR		47
Daphnia magna	waterflea	triclopyr TEA	LC_{50}	1,055	NR	NR		47
Daphnia magna	waterflea	triclopyr BEE	LC_{50}	1.3	NR	NR		47
Daphnia magna	waterflea	triclopyr BEE	LC_{50}	8.9	NR	NR		47
Daphnia magna	waterflea	triclopyr TEA	NOEC	58	NR	NR	Brood size	55
Daphnia magna	waterflea	triclopyr TEA	LOEC	105	NR	NR	Brood size	55
Crassostrea virginica[a]	eastern oyster	triclopyr TEA	LC_{50}	58	NR	NR		47
Crassostrea virginica[a]	eastern oyster	triclopyr TEA	LC_{50}	>56	NR	NR		47
Uca pugilator[a]	fiddler crab	triclopyr TEA	LC_{50}	>1,000	NR	NR		47
Palaemontes pugio[a]	grass shrimp	triclopyr TEA	LC_{50}	326	NR	NR		47
Penaeus duorarum[a]	pink shrimp	triclopyr TEA	LC_{50}	895	NR	NR		47
Menidida beryllina[a]	tidewater silverside	triclopyr TEA	LC_{50}	130	NR	NR		47
Crassostrea virginica[a]	eastern oyster	triclopyr BEE	LC_{50}	0.32	NR	NR		47
Palaemontes pugio[a]	grass shrimp	triclopyr BEE	LC_{50}	2.5	NR	NR		47
Palaemontes pugio[a]	grass shrimp	triclopyr BEE	LC_{50}	1.7	NR	NR		47
Menidida beryllina[a]	tidewater silverside	triclopyr BEE	LC_{50}	0.45	NR	NR		47
Menidida beryllina[a]	tidewater silverside	triclopyr BEE	LC_{50}	0.76	NR	NR		47
Acroneuria abnormis	stonefly	form. triclopyr BEE[b]	LC_{50}	320	NR	NR		56
Dolophilodes distincta	caddisfly	form. triclopyr BEE[b]	LC_{50}	0.7-1.27	NR	NR		56
Epeorus vitrea	mayfly	form. triclopyr BEE[b]	LC_{50}	320	NR	NR		56
Heptagenia flavescens	mayfly	form. triclopyr BEE[b]	LC_{50}	320	NR	NR		56
Hydropsyches sp.	caddisfly	form. triclopyr BEE[b]	LC_{50}	310	NR	NR		56
Isogenoides sp.	stonefly	form. triclopyr BEE[b]	LC_{50}	21.8-126	NR	NR		56
Isonychia sp.	mayfly	form. triclopyr BEE[b]	LC_{50}	320	NR	NR		56
Ophiogomphus carolus	dragonfly	form. triclopyr BEE[b]	LC_{50}	320	NR	NR		56
Pteronarcys sp.	stonefly	form. triclopyr BEE[b]	LC_{50}	290	NR	NR		56
Pycnopsyche guttifer	caddisfly	form. triclopyr BEE[b]	LC_{50}	290	NR	NR		56
Simulium sp.	blackfly	form. triclopyr BEE[b]	LC_{50}	249-370	NR	NR		56
Median concentration that caused 50% mortality in aquatic invertebrates: >56 mg/L								

NR = Not Reported; TEA = Triethylamine salt; BEE = Butoxyethyl ester; Statistical significance was not reported.
Age was not reported in any of the studies.
[a] Report did not say if the concentrations were in active ingredient or acid equivalent. It is likely that the numbers in the table are in units of active ingredient.
[b] The formulated product is not described so determining the acid equivalents is not possible. Most likely, the formulation was approximately 60% triclopyr BEE.

1.5 Appendix F: Toxicity of Clopyralid to Animals and Other Organisms

Table F-2. Clopyralid Toxicity to Birds: Mortality

Scientific Name	Common Name	Age (days)	Formulation	Concentration[a] or dose (mg/kg)	Study Duration (days)	Endpoint[b]	Type of Exposure[c]	Ref
Anas platyrhynchos	mallard duck	140	NR	> 2,000	14	LD_{50}	oral	4
Anas platyrhynchos[d]	mallard duck	10	clopyralid acid	> 4,640–5,620	8	LC_{50}	diet	4
Anas platyrhynchos	mallard duck	NR	clopyralid acid	1,465	14	LD_{50}	oral	4
Colinus virginianus[e]	northern bobwhite	NR	clopyralid acid	> 4,640–5,620	8	LC_{50}	diet	4
Median LD_{50} for birds: 1,698 mg/kg								
Median LC_{50} for birds: >5,401 mg/kg								

NR = Not Reported

[a] An attempt was made to put all concentrations in units of "acid equivalents;" however, units were not reported in some studies.

[b] LC_{50} values are the concentration in mg chemical per kg food. LD_{50} represent the dose in mg chemical per kg organism body weight.

[c] Dose frequency was not reported.

[d] There are two studies which bracket the extremes of the range.

[e] There are three studies included in this range.

Table F-3. Toxicity of Clopyralid to Honey Bees: Mortality Using an LD_{50} Endpoint.

Scientific Name	Common Name	Age (days)	Formulation	Dose (µg/bee)	Study Duration (days)	Exposure Type	Ref
Apis mellifera	honeybee	NR	NR	100	2	oral	4
Apis mellifera[a]	honeybee	NR	NR	100	2	topical	4

NR = Not Reported. The studies do not report how many applications were made. Statistical significance was not reported.

[a] There are two studies that yield this result.

Table F-4. Clopyralid Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Scientific Name	Common Name	Length, Weight, Age (cm, g, day)	Formulation	Water Flow	Conc. (mg/L)[a]	Duration (days)	Dose Freq.	Ref
Lepomis macrochirus	bluegill	NR, 0.1, NR	clopyralid MEA	static	1,645	4	once	4
Lepomis macrochirus	bluegill	NR, NR, NR	clopyralid acid	static	125	4	once	4
Oncorhynchus mykiss	rainbow trout	NR, 0.25, NR	clopyralid MEA	static	700	4	once	4
Oncorhynchus mykiss	rainbow trout	NR, NR, NR	clopyralid acid	static	104	4	once	4
Oncorhynchus mykiss	rainbow trout	NR, NR, ~7	clopyralid acid	flow[b]	700	4	once	57
Salvelinus confluentus	bull trout	NR, NR, NR	clopyralid acid	flow	802	4	once	57
Pimephales promelas	fathead minnow	NR, 0.2, NR	clopyralid MEA	static	>1,015	4	once	4

NR = Not Reported

[a] As discussed above, the USFS report stated that conversion of 2,000 mg a.i./L monoethanolamine salt of clopyralid (35% a.e.), gives 700 mg a.e./L. Presumably, the "35%" refers to the amount of clopyralid in the formulated product because the ratio of the molecular weight of clopyralid monoethanolamine to clopyralid acid is 0.756 and not 35%. This same record appears in the AQUIRE database, however no information on a.i. versus a.e. is given.

[b] Flow-chamber study.

Table F-5. Clopyralid Toxicity to Fish: Mortality Using an LC_x Endpoint

Scientific Name[a]	Common Name	Endpoint	Formulation	Water Flow	Conc. (mg/L)	Duration (days)	Dose Freq.	Ref
Oncorhynchus mykiss	rainbow trout	LC_5	clopyralid acid	NR	448	4	once	57
Oncorhynchus mykiss	rainbow trout	LC_{10}	clopyralid acid	NR	476	4	once	57
Oncorhynchus mykiss	rainbow trout	LC_{20}	clopyralid acid	NR	532	4	once	57
Oncorhynchus mykiss[c]	rainbow trout	model LC_1	clopyralid acid	NR	477	4	once	57
Salvelinus confluentus	bull trout	LC_5	clopyralid acid	NR	458	4	once	57
Salvelinus confluentus	bull trout	LC_{10}	clopyralid acid	NR	496	4	once	57
Salvelinus confluentus	bull trout	LC_{20}	clopyralid acid	NR	582	4	once	57
Salvelinus confluentus[c]	bull trout	model LC_1	clopyralid acid	NR	552	4	once	57

NR = Not Reported

[a] The age, weight and length of the fish were not recorded.

[b] Flow chamber study.

[c] The chronic LC_1 was estimated using a statistical model. Problems associated with this value are provided in the text.

Table F-6. Clopyralid Toxicity to Aquatic Invertebrates.

Scientific Name	Common Name	Age	Formulation	Concentration (mg/L)	Study Duration (days)	End-point	Effect	Application Frequency	Ref
Daphnia magna	waterflea	< 24 hr	NR	1,130[b]	2	EC_{50}	intoxication	once	4
Daphnia magna	waterflea	< 24 hr	clopyralid acid	225-232[a, b]	2	EC_{50}	intoxication	once	4
Daphnia magna	waterflea	NR	clopyralid MEA	350	NR	LC_{50}	intoxication	once	58
Daphnia magna	waterflea	NR	clopyralid MEA	23	NR	NOEC	intoxication	once	58
Chironomus sp.	midge	NR	fernanoxone	850	1	LC_{50}	mortality	once	4
Chironomus sp.	midge	NR		750	2	LC_{50}	mortality	once	4
Chironomus sp.	midge	NR		990	0.5	LC_{50}	mortality	once	4
Median LC_{50} for aquatic invertebrates: 750 mg/L									

NR = Not reported.

[a] Two studies represent this range.

[b] It is not clear whether this is in active ingredients or acid equivalents.

1.6 Appendix G: Toxicity of Clove Oil to Animals and Other Organisms

Table G-2: Clove Oil Toxicity to Insects: Mortality Using an LC_{50} Endpoint

Common and Scientific Name	Compound	Endpoint	Value	Reference
Sitophilus zeamais	eugenol	LD_{50}	30 µg/mg insect	59
Tribolium castaneum	eugenol	LD_{50}	31 µg/mg insect	59
Elateridae	eugenol	LD_{50}	517 µg/insect	60
Dermatophagoides farinae	eugenol	LD_{50}	0.52 kg/ha	61
Dermatophagoides pteronyssinus	eugenol	LD_{50}	0.37 kg/ha	61
Tyrophagus putrescentiae	eugenol	LD_{50}	1.2 kg/ha	62
Ochlerotatus caspius	eugenol	LC_{50}	7.5 mg/L	63
Ochlerotatus caspius	eugenol	LC_{50}	5.6 mg/L	63
Aedes aegypti	eugenol	LC_{50}	33 ppm	64
Trichoplusia ni	clove oil	LC_{50}	3700 ppm	65
Pseudoaletia unipuncta	clove oil	LC_{50}	4900 ppm	65
Pediculus capitis	eugenol	LC_{50}	25 kg/ha	66
Coptotermes formosanus	clove oil	LC_{100}	2 kg/ha	67
Median concentration that caused 50% mortality in insects: 0.52 kg/ha				

Table G-3: Clove Oil Toxicity to Microbes: Minimum Inhibitory Concentration Endpoint

Common and Scientific Name	Compound	Endpoint	Value	Reference
Candida albicans	eugenol	MIC	625 mg/L	68
Crytococcus neoformans	eugenol	MIC	293 mg/L	68
Median minimum inhibitory concentration: 293 mg/L				

Table G-4: Clove Oil Toxicity to Fish: LC_{50} and Sedation

Common and Scientific Name	Compound	Endpoint	Value	Reference
Rainbow trout, *Oncorhynchus mykiss*	clove oil	10min LC_{50}	81 mg/L	69
Rainbow trout, *Oncorhynchus mykiss*	clove oil	96 h LC_{50}	14 mg/L	69
Carp, *Cyprinus carpio*	clove oil	10min LC_{50}	74 mg/L	70
Carp, *Cyprinus carpio*	clove oil	96 h LC_{50}	18 mg/L	70
European catfish, *Silirus glanis*	clove oil	10min LC_{50}	77 mg/L	69
European catfish, *Silirus glanis*	clove oil	96 h LC_{50}	18 mg/L	69
Rainbow trout, *Oncorhynchus mykiss*	eugenol	30min LC_{50}	65 mg/L	71
Rainbow trout, *Oncorhynchus mykiss*	eugenol	12 h LC_{50}	9 mg/L	71
Tambaqui, *Colossoma macropomum*	eugenol	sedation	65 mg/L	72
Median concentration that caused 50% mortality in fish: 42[a] mg/L				

[a] Averaged from two LC_{50} values: 18 mg/L (96 hour) and 65 mg/L (30 minutes).

Table G-5: Clove Oil Toxicity to Aquatic Invertebrates: LC_{50} and Sedation

Common and Scientific Name	Compound	Endpoint	Value	Reference
Penaeus semisulcatus	clove oil	1 h LC_{50}	130 mg/L	73
Penaeus semisulcatus	clove oil	24 h LC_{50}	30 mg/L	73
Macrobrachium rosenbergii	clove oil	sedation	300 mg/L	74
Biomphalaria alexandria	eugenol	LC_{50}	28 mg/L	75
Bulinus truncatus	eugenol	LC_{50}	24 mg/L	75
Lymneae natalensis	eugenol	LC_{50}	22 mg/L	75
Median concentration that caused 50% mortality in aquatic invertebrates: 28 mg/L				

1.7 Appendix H: Toxicity of Pelargonic Acid to Animals and Other Organisms

Table H-2: Nonanoic Acid Toxicity to Birds: Mortality Using an LC_{50} Endpoint

Common Name	Scientific Name	Compound	Endpoint	Value (mg/kg)	Reference
Mallard duck	*Anas platyrhynchos*	soap salts	8 day LD_{50}	2,510	76
Mallard duck	*Anas platyrhynchos*	nonanoic acid	Sub-acute LC_{50}	5,620	4
Mallard duck	*Anas platyrhynchos*	soap salts	8 day LC_{50}	5,000	76
Bobwhite	*Colinus virginianus*	soap salts	8 day LC_{50}	5,000	76
Bobwhite	*Colinus virginianus*	nonanoic acid	LD_{50}	2,250	4
Bobwhite	*Colinus virginianus*	soap salts	8 day LD_{50}	2,000	76
Bobwhite	*Colinus virginianus*	soap salts	LD_{50}	2,150	76
Bobwhite	*Colinus virginianus*	nonanoic acid	Sub-acute LC_{50}	5,620	4
Median LC_{50} for concentration in food: 5,310[a] Median LD_{50} for dose to organism: 2,200[a]					

[a] The median LC_{50} and LD_{50} values are averages of two values: 5,000 and 5,620 mg/kg and .2,150 and 2,250 mg/kg respectively.

Table H-3: Nonanoic Acid Toxicity to Fish: Mortality Using an LC_{50} Endpoint

Common Name	Scientific Name	Compound	Endpoint	Value (mg/kg)	Reference
Red killifish	*Oryzias latipes*	capric acid	48 hr LC_{50}	20	77
Red killifish	*Oryzias latipes*	sodium caprate	LC_{50}	54	77
Fathead minnow	*Pimephales promelas*	soap salts	LC_{50}	21	76
Fathead minnow	*Pimephales promelas*	capric acid	96 hr LC_{50}	104	77
Bluegill sunfish	*Lepomis macrochirus*	soap salts	96 hr LC_{50}	9.2	76
Bluegill sunfish	*Lepomis macrochirus*	soap salts	96 hr LC_{50}	18.1	76
Bluegill sunfish	*Lepomis macrochirus*	soap salts	96 hr LC_{50}	91	4
Rainbow trout	*Oncorhynchus mykiss*	soap salts	96 hr LC_{50}	23	76
Rainbow trout	*Oncorhynchus mykiss*	soap salts	96 hr LC_{50}	35.4	76
Rainbow trout	*Oncorhynchus mykiss*	soap salts	96 hr LC_{50}	105	4
Median LC_{50}: 29.2 mg/L					

[a] The median LC_{50} value averages two values: 23 and 35.4 mg/L.

Table H-4: Nonanoic Acid Toxicity to Amphibians: Mortality Using an LC_{50} Endpoint

Common Name	Scientific Name	Compound	Endpoint	Value (mg/kg)	Reference
African claw frog	*Xenopus laevis*	decanoic acid	96 hr LC_{50}	24	4
African claw frog	*Xenopus laevis*	decanoic acid	96 hr EC_{50}	7.5	4
African claw frog	*Xenopus laevis*	nonanoic acid	96 hr LC_{50}	32.7	4
African claw frog	*Xenopus laevis*	nonanoic acid	96 hr EC_{50}	6.5	4
Median LC_{50}: 15.3 mg/L					

[a] The median values are averages of two values: 7.5 and 24 mg/L.

Table H-5: Nonanoic Acid Toxicity to Aquatic Invertebrates: Mortality Using an LC_{50} Endpoint

Common Name	Scientific Name	Compound	Endpoint	Value (mg/kg)	Reference
Waterflea	*Daphnia*	soap salts	48 hr LC_{50}	0.57	76
Gammarus	*Hyale plumulosa*	capric acid	48 hr LC_{50}	41	77
Waterflea	*Daphnia*	nonanoic acid	48 hr LC_{50}	96	4
Waterflea	*Daphnia*	soap salts	48 hr LC_{50}	102	76
Median LC_{50}: 68 mg/L					

[a] The median values are averages of two values: 41 and 96 mg/L.

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RESPONSE TO COMMENT LETTER 13 - MICHAEL W. GRAF, COMMUNITY VENTURE PARTNERS AND SUSTAINABLE TAM/ALMONTE, JULY 8, 2015

Response to Comment 13-1

The Draft TPEIR, the BMPs and mitigation measures, and response to comments describes the types of herbicides and the application techniques used. The VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to managing vegetation in order to increase the program's efficiency and effectiveness. The plan does not require, allow, or prohibit any treatment method. Rather, it requires the use of an IPM approach, which is a scientific and evidence-system for selecting the least environmentally damaging most effective treatment method. The amount of herbicide that the MCOSD would be used in the future cannot be determined because of this IPM approach that uses the least amount of herbicide based on site-specific conditions. Because site-specific conditions change regularly, the amount of herbicide needed in the future, if any, is highly variable. The Draft TPEIR discloses the list of herbicides intended for use and a screening level risk analysis was done on each herbicide using scientific data from recognized and reviewed sources regarding the environmental fate and toxicity of the herbicides. These data were combined with conservative assumptions regarding exposure to estimate potential risk. As needed, BMPs and/or mitigation measures were designed to address potential risk and reduce it to a less-than-significant level. As practicable and feasible, the MCOSD will consider non-herbicide options. Any consideration of non-herbicide options, however, will only be done after a thorough review of the risks such reductions and eliminations may cause. These risks include: injury to MCOSD personnel from the use of manual and power-driven tools; risk of fire and subsequent injury, death and loss of property if vegetation is left uncontrolled and becomes dry fuel; loss of habitat and biodiversity as a result of the inability to adequately control non-native, invasive species; and loss of threatened, endangered and listed species as a result of displacement by non-native, invasive species. Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion on alternatives and an herbicide-free approach.

Response to Comment 13-2

Contrary to the comment, the Draft TPEIR does adequately describe the existing environmental setting. **Exhibit 1.0-1** shows the location of the 34 Marin County Open Space District preserves in Marin County. The project location together with a discussion of the six geographic regions are described in **Chapter 3.0 Description of the Proposed Project**. Furthermore, reference to Chapter 2 Preserve Conditions: Inventory and Assessment in the draft VBMP is made in **Chapter 3.0**. As noted, **Table 2.1** [*Summary of Preserve Conditions*] in the draft VBMP contains a summary of conditions for each preserve.

As stated in **Chapter 5.0 Environmental Setting, Impacts, and Mitigation Measures**, existing environmental conditions are described in the respective "setting" sections. The existing conditions are described as they existed in December 2013, the time the Notice of Preparation was published. These descriptions summarize information complied during the study process to prepare the Draft TPEIR.

Sections 5.1 through 5.9 of **Chapter 5.0** describe existing environmental conditions as they relate to each specific topic as follows:

5.1 Biological Resources	pages 105 to 119
5.2 Hydrology and Water Quality	pages 147 to 159

5.3 Geology and Soils	pages 179 to 185
5.4 Hazards - Fire Hazards	pages 195 to 217
5.5 Hazards - Herbicide use	pages 243 to 250
5.6 Air Quality / Greenhouse Gases	pages 275 to 279
5.7 Noise	pages 293 to 296
5.8 Visual Quality	pages 305 to 307
5.9 Cultural Resources	pages 317 to 318

Response to Comment 13-3

Table B.2 (*Vegetation Types Presented by Preserve*), contained in **Appendix B** of the draft VBMP, includes acreage estimates of some of the more widespread invasive species that have been mapped on various MCOSD preserves. These include French broom, Harding grass, teasel (*Dipsacus sativa*), pampas grass, and eucalyptus. Furthermore, **Table 2.1** (*Summary of Preserve Conditions*) in the draft VBMP includes a column that describes "Management Challenges". These challenges include a discussion of invasive plants in specific preserves. In addition, the draft VBMP includes a program for implementing a system-wide early detection of invasive plants and rapid response (see pages 6-5 and 6-6 of the draft VBMP). The MCOSD also continually updates its weed data through CalFlora, Cal-IPC, and other information sources.

The TPEIR is a program EIR as described by section 15168 of the *State CEQA Guidelines*. As such, future projects will have environmental review that tiers off the program EIR and will include site specific data, including the types, locations, and concentration of invasive weeds.

Response to Comment 13-4

The commentor states that the VBMP fails to describe the effectiveness of past herbicide applications on District land. The commentor specifically refers to **Table 5-1** (*List of Potential Projects to be Implemented*), which is a list of potential projects that could be implemented under the VBMP. The plan describes this table as "projects that are either ongoing or that have been planned or proposed to date".[87] The projects listed in this table are either ongoing, proposed, or planned. For the proposed and planned projects, the MCOSD, obviously, does not yet have information on their effectiveness. For those projects that are ongoing, the MCOSD is monitoring the effectiveness of the treatment, but it is premature to make any conclusions on the efficacy of the project.

Response to Comment 13-5

The commentor states that the Draft TPEIR fails to adequately describe the project. Contrary to the assertion by the commentor, **Chapter 3.0 Description of the Proposed Project** does provide a complete description of the major components of the proposed project (the Vegetation

[87] *Vegetation and Biodiversity Management Plan*, Marin County Parks, Marin County Open Space District, April 2015 Draft, page 5-1.

and Biodiversity Management Plan [VBMP]). Consistent with the _State CEQA Guidelines_, **Chapter 3.0** does acknowledge that the proposed project includes the whole of the action, which has a potential for resulting in either a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment. This chapter describes the location of MCOSD preserves, the content of the draft VBMP, the strategies that would be used to develop and prioritize vegetation management projects, and the nature of activities that would occur when projects are implemented.

Response to Comment 13-6

Please refer to **Master Response 2 – Use of Glyphosate**. The Draft TPEIR statement regarding toxicity of herbicides to non-plant species was general in nature and not intended to be applicable to all circumstances. The commentor uses toxicity data from the Marin Municipal Water District out of context and without consideration for real world conditions. For example, the data on which the Lowest Observed Effect Level (LOEL) of 3.7 mg/Kg day was derived based on oral exposure to the Mallard Duck. The Mallard Duck's diet is mainly aquatic plants. A typical application of RoundUp Custom (glyphosate) of one gallon per acre and a water depth of one foot results in a concentration of glyphosate of 0.04 mg/L (ppm). The one kg duck would have to consume nearly 100 L (26 gallons) of water or over 100 kg (220 lbs) of vegetation on a daily basis to reach the LOEL. Clearly, neither of these daily consumption rates are possible for a one kg duck and are likely off by a factor of between 100 and 1,000. Further, the commentor cites glyphosate toxicity to a variety of aquatic species including rainbow trout, amphibians, and aquatic invertebrates. The lowest concentration reported to cause an adverse impact is 0.17 mg/L when Vision® was tested on water flea. Again, this is not an environmentally relevant concentration as the expected concentration of glyphosate from a typical application is less than 25 percent of the concentration causing the reported adverse impact. The use of the Vision® water flea data is further made irrelevant because Vision® is neither registered for use in the United States or California and is not allowed for use in aquatic environments.

Although glyphosate and triclopyr demonstrates toxicity as correctly stated by the commentor, the data are not environmentally relevant and do not apply to the MCOSD's vegetation management practices. Accordingly, the use of glyphosate and triclopyr by the MCOSD does not pose an unacceptable risk. Please see **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality and aquatic receptors.

Response to Comment 13-7

The commentor raises a question regarding the scope of herbicide uses. The commentor references text in **Chapter 2.0 Summary of Findings r**egarding the use of "conventional herbicides" (see page 18 of the Draft TPEIR). A full discussion the MCOSD's use of specific herbicide products and the methods utilized by the District is provided on pages 246 through 248 of the Draft TPEIR. **Table 4.4** (_Priority Invasive Plants_) in the draft VBMP lists the priority invasive plants that are targeted for management in the MCOSD preserves. **Table 4.7** (**Recommended Treatment Options for Target Invasive Plants**) provides recommended treatment options for each priority invasive plant. The application methods and the potential herbicides to be used are described in **Chapter 5.5 Hazards - Herbicide Use**.

Additionally, the VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to managing vegetation in order to increase the program's efficiency and effectiveness. As a high level plan, it does not provide prescriptions for treatment methods or the scope of herbicide use. Pursuant to CEQA, TPEIR is a program EIR as described by section 15168 of the CEQA Guidelines. As such, future projects will have environmental review that tiers off the program EIR and will include project specific data, including a description of the treatment method for the proposed project.

Response to Comment 13-8

Table 4.7 (*Recommended Treatment Options for Target Invasive Plants*) in the draft VBMP provides recommended treatment options, including chemical control methods. It is noted that in most cases, more than one treatment type would be required to fully eradicate or control the species. Based on the draft VBMP (including **Table 4.7**) herbicide applications were categorized into separate application scenarios and given a distinct application scenario number based on the products used and the methods of application. **Exhibit 5.5-3** in the Draft TPEIR presents the 28 application scenarios, including foliar applications. As noted foliar applications include foliar directed applications made via backpack-based applicators, ThinLine, truck mounted wands, and ATV drawn booms.

Foliar applications are done using a low pressure tank and application system with nozzles that produce large droplet sizes that minimize or eliminate drift. As needed, adjuvants are added to the tank mix to retard drift and enhance adherence of the herbicide to the plant. As required by the product label, herbicide applications are not made during times when sufficient wind is present that may result in a drift hazard.

In should be noted that the draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity.

Response to Comment 13-9

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide regulations, labels, and safety.

Response to Comment 13-10

The draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the Draft TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity.

Response to Comment 13-11

Table B.2 (*Vegetation Types Presented by Preserve*), contained in **Appendix B** of the draft VBMP, includes acreage estimates of some of the more widespread invasive species that have been mapped on various MCOSD preserves. These include French broom, Harding grass, teasel (*Dipsacus sativa*), pampas grass, and eucalyptus. Furthermore, **Table 2.1** (*Summary of Preserve Conditions*) in the draft VBMP includes a column that describes "Management Challenges". These challenges include a discussion of invasive plants in specific preserves. In addition, the draft VBMP includes a program for implementing a system-wide early detection of invasive plants and rapid response (see pages 6-5 and 6-6 of the draft VBMP).

Additionally, The draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the Draft TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity.

Response to Comment 13-12

The commentor states that the neither the VBMP nor the TPEIR present any information about the location of sensitive natural resources. The commentor argues that although **Table 2.1** (*Summary of Preserve Conditions*)of the VBMP identifies existing preserve conditions including the presence of sensitive natural resources, known special-status or locally rare species, and management challenges, including the presence of invasive species, the VBMP does not present any information about the location of these resources, except to say that they are located within the preserves.

The VBMP is a comprehensive plan that will provide the MCOSD with a strategic approach to managing vegetation in order to increase the program's efficiency and effectiveness. The plan requires the use of an IPM approach, which is a scientific system for selecting the least environmentally damaging most effective treatment method. The TPEIR is a program EIR as described by section 15168 of the *State CEQA Guidelines*. The MCOSD will evaluate future projects to determine if it needs to prepare additional environmental documents. If these projects have effects not anticipated in the TPEIR, the MCOSD will prepare an initial study leading to either negative declaration or an environmental impact report. As the MCOSD develops projects based on the VBMP, it will consider the proximity to the sensitive natural resources and develop a treatment program that adequately addresses potential impacts to these resources. As the MCOSD develops specific projects, it will evaluate the project-level effects, including impacts to sensitive natural communities.

As identified by the commentor, the open space preserves contain a variety of natural communities, some of which have a state rank of 1, 2, or 3, which means that the state considers these associations to be highly imperiled. However, the commentor is incorrect in stating that the plan does not identify the location of these resources. The plan relies on the use of the vegetation zones to identify these sensitive areas. Most of these special-status communities are mapped as Legacy or Sustainable Natural Systems Zones. MCOSD zoning relies on an extensive vegetation mapping effort (*Classification of Vegetation Associates from the Marin County Open Space District in Marin County, California*, March 2010) to identify the affected natural communities and as basis of the vegetation zoning. The VBMP includes maps of the various vegetation zones and incorporates the vegetation classification by reference. Also, see Master Response 12 - Deferral of Analysis and Mitigation.

Response to Comment 13-13

The Draft TPEIR statement regarding toxicity of herbicides to non-plant species was general in nature and not intended to be applicable to all circumstances. The risk-screening analysis presented in the Draft TPEIR identified scenarios that had an increased potential for risk and impact. See Response to Comments 13-14 through 13-29.

Response to Comment 13-14

See Response to Comments 13-15 through 13-24.

Response to Comment 13-15

See Response to Comment 13-06. Both LD50s and LC50s are indicators of the general toxicity of a chemical towards a species. For example, as discussed on pages 261-262 of the Draft TPEIR, if the LD50 for oral exposure of a particular species to a specific chemical is greater than or equal to 2,000 mg/kg-day, such a chemical would be considered "Practically non-toxic". This is because it would be virtually impossible for the organism to be exposed to hazardous or lethal amounts of the chemical under realistic conditions.

Although it is accurate that sub lethal effects occur at concentrations below the lethal concentration, the lethal and sublethal concentrations are greater than the environmentally relevant concentration that would result from the use of herbicides by the MCOSD. Because the expected concentration of herbicides, such as glyphosate, in the environment is less than either the lethal or sublethal concentrations, the use of herbicides does not result in adverse impact.

Response to Comment 13-16

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity. Please refer to **Master Response 4 – Adjuvants and Inert Ingredients** and **Master Response 6 – Impact Evaluation** for discussions on herbicide formulation toxicity and cumulative impacts. Also see Response to Comment 14-37 regarding cumulative impacts.

Response to Comment 13-17

Consistent with USEPA ecological risk assessment guidance, the screening level risk analysis used appropriate surrogates to assess terrestrial amphibians, invertebrates, soil invertebrates, reptiles, birds, and mammals. Use of MCOSD-specific species was not feasible because toxicity data for many of these species is not available, and hence the necessity to use surrogates. The commentor cites various pages out of the appendix to the MMWD Risk Assessment. Because the MMWD Risk Assessment uses data out of context, the comments of the commentor are also out of context. For example, one the papers cited by MMWD (Sullivan 1990) reference No Observed Effect Level (NOEL) or Lowest Observed Effect Level (LOEL). This paper relied on population level studies on a 60 acre parcel. This approach is inconsistent with the standard methodology used of statistically analyzing data from multiple separate animal tests to develop toxicologically relevant end points. Hence, the NOEL and LOEL values derived from the Sullivan study are not comparable to other NOELs and LOELs. Even if the use of population data on such a large scale was plausible, the relevance of the data is in question because the authors reported no difference between vole populations in treated plots vs. the control. Accordingly, the use of herbicides by the MCOSD is not expected to present an unacceptable risk to small mammals and terrestrial invertebrates.

Response to Comment 13-18

Comment noted. Also, please see **Master Response - Mitigation Measure 5.2-1,** which includes additional BMPs (most of which are recommended by the California Invasive Plant Council (Cal-IPC) Best Management Practices for Wildland Stewardship and additional mitigations that address timing of aquatic or near-aquatic herbicide applications and well as methods.

Response to Comment 13-19

See Response to Comments 13-14 through 13-18. Refer **to Master Response 2 – Use of Glyphosate** for a discussion of glyphosate toxicity, safety, and effects on wildlife.

Response to Comment 13-20

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity and environmental fate. Refer to **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for discussions on cumulative impacts.

Response to Comment 13-21

Please see **Master Response 6 – Impact Evaluation** for a discussion on spray drift and volatilization.

Response to Comment 13-22

Mitigation Measure 5.5-1 requires the use of targeted application methods, such as foliar spot spray. These targeted application methods significantly reduce exposure to non-target receptors because herbicide application is targeted to specific plants and not broadcast. The MCOSD addresses potential impacts to sensitive natural resources through the use of numerous BMPs and Mitigation Measures. Please refer to **Master Response 7 – Hydrology and Water Quality** for a discussion on impacts to water quality. Also, please see Response to Comments 7-18, 11-18, 13-06, 13-15,and 13-17.

Response to Comment 13-23

Please see **Master Response 5 – Herbicide Use** for a discussion of herbicide regulation, labels, and safety. Although following label requirements is a fundamental part of ensuring safe use of herbicides, the PEIR did not assume that impacts to wildlife would be avoided exclusively through following label requirements. Impacts to wildlife were evaluated in the TPEIR risk screening analysis and mitigation measures were prescribed accordingly. Refer to Master Response Regarding Mitigation Measure 5.2-1 for a discussion on impacts to water quality.

See **Master Response 2 – Use of Glyphosate** for a discussion of glyphosate environmental fate and effects on wildlife. Also see **Master Response 12 - Deferral of Analysis and Mitigation** regarding deferred mitigation.

Response to Comment 13-24

Please see **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality. Refer to **Master Response 6 – Impact Evaluation** for discussion on spray drift and volatilization.

Response to Comment 13-25

See Response to Comment 13-22. The Draft TPEIR offers mitigation measures to identify and actively prevent exposure to non-target plants. Please refer to Mitigation Measure 5.5-3 on page 271 of the Draft TPEIR.

Response to Comment 13-26

Please see **Master Response 2 - Use of Glyphosate** for a discussion on glyphosate toxicity, safety, and environmental fate, **Master Response 5 - Herbicide Use** for a discussion on postings, signage, and exposure, and Response to Comment 7-04.

Response to Comment 13-27

Comment noted. Also, see **Master Response 7 - Hydrology and Water Quality**, which includes additional BMPs (most of which are recommended by the Cal-IPC Best Management Practices for Wildland Stewardship) and additional mitigations that address timing of aquatic or near-aquatic herbicide applications and well as methods. The additional mitigations act to further restrict the seasonal timing of herbicide applications within designated stream buffer zones and the conditions under which MCOSD staff and licensed Pest Control Advisors (PCAs) can consider overriding the seasonal restriction where the impacts of non-control of invasive outbreaks outweigh those associated with herbicide applications.

The draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the Draft TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity.

Also see Response to Comment 13-24 and **Master Response 12 - Deferral of Analysis and Mitigation** regarding deferred mitigation.

Response to Comment 13-28

Please see **Master Response 6 – Impact Evaluation**.

Response to Comment 13-29

Because the MCOSD uses an integrated pest and vegetation management approach, constant evaluation of vegetation type and density is done before vegetation control is undertaken. Depending on the objective, the degree, and type of vegetation control will vary. For example, the use of selective herbicides to remove broadleaf weeds and leave grasses in place is common. Other approaches, some of which are applicable to fuel breaks for fire control include “mowing” with herbicides to reduce the amount of vegetation without killing it and the use of mowers, discing, and goat grazing. After initial vegetation control activities have been completed, MCOSD regularly scout the preserves to assess changes in plant type and location. Among the purposes of this critical scouting activity is to identify and control non-native invasive weeds in advance of their spread and colonization. A further objective is to assess sloped areas to ensure that sufficient vegetation is present to provide erosion control during the rainy season. Because there is a need to balance fuel management for fire protection, invasive species management, and erosion control, the MCOSD places a high level of importance on pre- and post-vegetation management assessments.

Response to Comment 13-30

Please see **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for a discussion on cumulative impacts.

Response to Comment 13-31

Please see **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for discussions on cumulative impacts. Refer to **Master Response 2 – Use of Glyphosate** for a discussion on the environmental fate of glyphosate.

Response to Comment 13-32

The commentor states that the use of herbicides in fire fuel management has the potential for cumulative impact with herbicide use to control invasive species.

The District and its contractors are the sole entities that apply herbicides within MCOSD's preserves and would remain so with implementation of the VBMP. The Marin County Fire Department's *Strategic Fire Plan for Marin County* does not propose the use of herbicides and therefore would not contribute towards cumulative impact of herbicides.

Response to Comment 13-33

Please see Response to Comment 13-29.

Response to Comment 13-34

Please see **Master Response 6 – Impact Evaluation** and Response to Comment 14-37 for a discussion of cumulative impacts.

Response to Comment 13-35

Please see **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 13-36

Please see **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 13-37

Please see **Master Response 5 – Herbicide Use** for a discussion on herbicide regulation and labels, and Response to Comments 4-87, 7-18, and 13-01.

Response to Comment 13-38

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion of alternatives and the herbicide-free approach.

Response to Comment 13-39

Comment noted. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis.

Response to Comment 13-40

Comment noted.

Response to Comment 13-41

See Response to Comment 13-38.

Comment Letter 14

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July 8, 2015

via email
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Re: Marin County Open Space District Vegetation and Biodiversity Management Plan Draft Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063) and Draft Vegetation and Biodiversity Management Plan

Mr. Raives:

On behalf of North Coast Rivers Alliance ("NCRA"), we submit the following comments on the Marin County Open Space District's Draft Tiered Program Environmental Impact Report ("DEIR") for the Draft Vegetation and Biodiversity Management Plan (the "VBMP Project" or "Project").

The picturesque lands that make up the Marin County Open Space District ("MCOSD") play an important role in preserving the beauty and bucolic character of Marin County. They serve critical ecological functions, by preserving natural habitats, wildlife migration corridors, streamside and lakeside buffers, refugia for endangered species, and genetic reservoirs for all species, and by maintaining visual separation between urban areas. NCRA fully supports MCOSD's preservation and protection of these peaceful open spaces for hiking, quiet contemplation, and wildlife protection and observation. NCRA urges MCOSD to stand firm against activities that threaten the vital resources. Sadly, MCOSD's VBMP Project is itself a threat to the lands it purports to manage and protect. By increasing the use of chemical controls, through pesticide[1] applications, MCOSD threatens the ecological health of the preserve system

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[1] Under federal law, a pesticide is (with exceptions that do not apply): "(1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant . . ." 7 U.S.C. § 136 (t). A pest is defined as "(1) any insect, rodent, nematode, fungus,

and the health and safety of those who use it.

The DEIR fails to satisfy the requirements of the California Environmental Quality Act
14-01 (“CEQA”), Public Resources Code section 21000 *et seq.*,[2] in five overarching respects. First, the
DEIR’s alternatives analysis omits a no-pesticide alternative, is too vague to permit informed
review, and is biased in favor of MCOSD’s chosen project. Second, the DEIR improperly relies
14-02 upon the Marin Municipal Water District’s (“MMWD’s”) vegetation management plan to
support its use of pesticides despite the fact that MMWD recently voted to *prohibit* pesticides
because of concerns about human health impacts and toxicity to wildlife. Third, the DEIR’s
14-03 tiering strategy violates CEQA’s requirements. Fourth, the DEIR’s analysis of the Project’s
14-04 impacts is deficient in at least ten separate categories. Fifth, MCOSD unlawfully defers
14-05 formulation of mitigation measures to a future date, as discussed more fully below.

I. The Alternatives Analysis Is Inadequate to Promote Informed Decision-Making

14-06 The DEIR’s alternatives analysis is flawed in three ways. First, the DEIR fails to clearly describe the differences between the alternatives and the proposed project, an especially confusing omission with respect to Alternative 3, the “Risk Reduction” alternative. Second, the range of alternatives is inadequate; the DEIR should have analyzed a no-pesticide alternative. Third, the DEIR’s failure to assure that Alternatives 2 and 3 would include effective mitigation measures unlawfully sandbagged the analysis in favor of MCOSD’s chosen alternative.

The DEIR fails to clearly describe the differences between the alternatives and the proposed project. Pages 326 to 329 of the DEIR, which describe the three alternatives, compare the various alternatives to each other but make no reference to the proposed project at all. Though the DEIR does include seven pages of charts that purport to identify the differences between the proposed project and the three alternatives, the stated differences are vague and entirely unclear. What exactly *is* the difference between the proposed project’s “[c]hange in program emphasis to selection of projects/actions that improve the condition of natural resources

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weed, or (2) any other form of terrestrial or aquatic plant or animal life or virus, bacteria, or other micro-organism (except viruses, bacteria, or other micro-organisms on or in living man or other living animals) which the Administrator declares to be a pest under section 136w(c)(1) of this title.” 7 U.S.C § 136(t). California law similarly considers chemicals targeting unwanted plants to be pesticides. *See* Food & Ag. Code §§ 12753, 12754.5. Consistent with these definitions, NCRA will refer to the chemical treatments considered in the DEIR as “pesticides.”

[2] Undesignated references are to the Public Resources Code.

14-06 (cont.)

so they can withstand climactic and environmental changes" on the one hand, and Alternative 3's "[c]hange in program emphasis to selection of projects/actions that manage fire risk and control invasive plants"? DEIR at 331. Presumably "improv[ing] the conditions of natural resources" in MCOSD's preserves so as to "withstand climactic and environmental changes" includes "manag[ing] fire risk and control[ling] invasive plants," so the actual difference between these boilerplate statements is unclear. *Id.* The DEIR makes no effort, for instance, to provide an example of the different management strategies that the proposed project and Alternative 3 would offer. Nor does it explain the source of the supposed funding differences between the two. The DEIR's vague platitudes prevent the public from meaningfully considering the differences between and impacts of the alternatives presented and thus violate CEQA. 14 C.C.R. ["Guidelines"] § 15126.6(d) (a matrix may only be used to *summarize* the required comparison of alternatives with the project).

The DEIR's range of alternatives is also inadequate. An EIR must present a reasonable range of potentially feasible alternatives. Guidelines § 15126.6(a). "The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision making." Guidelines § 15126.6(f). Here, the DEIR's analysis flunks this test. One of the most controversial aspects of the proposed plan is its blanketing of Marin's last open space preserves with pesticides – as the comments on the DEIR will attest. The DEIR's failure to analyze an alternative that combined robust management activities with a ban on pesticides is thus unlawful. Such an alternative would have allowed the public to weigh the supposed financial and managerial benefits of pesticides against the environmental harm caused by their use. A no-pesticide alternative could potentially include features such as biological control of invasive species using natural predators and would avoid many of the potentially significant impacts identified in the DEIR. For example, it would prevent pesticides that are known to leach into groundwater from being sprayed atop aquifers, among many other environmental benefits. The only differences between Alternatives 1, 2, and 3 relate to their funding. By limiting itself to three alternatives with only minor differences, and by omitting a no-pesticide alternative, the DEIR frustrates informed decision making and thereby violates CEQA. Guideline § 15126.6(f).

Finally, MCOSD biased the alternatives analysis in favor of its chosen alternative by failing to include any mitigation measures in Alternatives 2 or 3. Although the preface to the comparison table states that "should either Alternative 2 or Alternative 3 be selected it is assumed that it would be necessary for MCOSD to adopt best management practices and mitigation measures similar to those for the proposed project" (DEIR at 338), the table itself repeatedly concludes that Alternatives 2 and 3 will have greater impacts than the proposed project because "there would be no mitigation measures to minimize" impacts (*e.g.*, DEIR at 340). Indeed, the table is internally inconsistent: it concludes that landslide impacts would be "similar" among the various alternatives because "it is likely [best management practices] would

14-06 (cont.) be implemented that would require" geotechnical surveys and appropriate construction methods, while at the same time concluding that, for instance, sedimentation would be worse under Alternatives 2 and 3 than the proposed project because "without the [proposed project] no new BMPs to help reduce erosion and sedimentation would be implemented." DEIR at 341-342. By failing to mitigate the environmental impacts of Alternatives 2 and 3, the DEIR predetermined the outcome of the alternatives analysis, thereby precluding informed decision making in violation of CEQA. Guidelines § 15126.6. At an absolute *minimum*, the DEIR should analyze two additional alternatives that are identical to Alternatives 2 and 3 except that they include the mitigation measures and best management practices that the DEIR itself states "would be necessary for MCOSD to adopt." DEIR at 338.

II. Reliance Upon MMWD Plan is Inappropriate

14-07 The DEIR repeatedly claims that MMWD uses pesticides to conduct weed control on its lands and claims that MCOSD will work collaboratively to apply pesticides in a coordinated manner. *See, e.g.*, DEIR 249-250. The VBMP itself also appears to rely upon MMWD's vegetation management plan as a source of its mitigation measures. *See, e.g.*, VBMP at 3-5 to 3-10 (discussing MMWD's management plans in its discussion of appropriate natural resource management measures).

But yesterday the MMWD "Board of Directors were given a standing ovation by a packed room of residents after they voted to approve Staff's recommendation to remove herbicides from further consideration in MMWD's DRAFT Wildfire Protection and Habitat Improvement Plan." Sharon Ruston, *The Marin Post, MMWD Board of Directors Votes to Remove Herbicides From Further Consideration!*, July 8, 2015, available at https://marinpost.org/blog/2015/7/8/mmwd-board-of-directors-votes-to-remove-herbicides-from-further-consideration (as visited July 8, 2015). It did so both due to community opposition and because the World Health Organization recently classified glyphosate as a probable human carcinogen. *See id. The MCOSD should follow MMWD's lead and remove the use of pesticides from consideration*. And regardless, it must completely revamp its DEIR and VBMP Project to reflect MMWD's enlightened rejection of pesticides as a vegetation management tool.

III. The DEIR is Inadequate to Allow Future Site-Specific Action without Further CEQA Review.

14-08 The information provided in the DEIR is not sufficient to adequately inform the public as to the site-specific impacts of VBMP Project. Indeed, the DEIR admits this deficiency. *See e.g.* DEIR at 138 ("further site-specific investigation and mapping would be required" to determine locations of sensitive resources, value of those resources, and actions to take), 139 (anticipates modifications to mitigations and management activities based on site-specific information), 186

14-08 (cont.)

(site-specific geological information not available), 210 (fuel-zone hazard assessment "not directly applicable for site-specific fuel management decisions). Thus, pursuant to the MCOSD's tiering strategy, it must conduct extensive additional studies before it may consider – let alone approve – site-specific vegetative management projects. DEIR at 76; Guidelines §§ 15152(f), 15168(c)(1). A "later EIR shall be required when the initial study or other analysis finds that the later project may cause significant effects on the environment that were not adequately addressed in the prior EIR." Guidelines § 15152(f). Moreover, CEQA mandates the issuance of a notice of determination whenever any subsequent activity is approved or carried out. § 21152.

14-09

IV. The DEIR's Impact Analysis Is Inadequate to Promote Informed Decision-Making

A. Biological Resources

The DEIR's analysis of the Project's impacts to biological resources is inadequate in four respects. First, the 100-foot buffer zone is riddled with exceptions and is thus inadequate as a mitigation measure. Second, formulation of mitigation measures is unlawfully deferred. Third, the EIR's conclusion that impacts will be mitigated to a less-than-significant level cannot stand in light of its acknowledgment that the Project may have unavoidable impacts to special-status species. *See Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* ("*Vineyard*") (2007) 40 Cal.4th 412, 449 (a "potential substantial impact on endangered, rare or threatened species is *per se* significant"). Fourth, the DEIR fails to quantify impacts to sensitive natural communities.

The Project includes a 100-foot buffer zone between management activities and "special-status species occurrences, or essential habitat features such as nests in active use." DEIR at 134. This mitigation measure is inadequate because it contains a gaping loophole. The DEIR notes that the Project did not originally permit any incursion into buffer zones and takes it upon itself to create a nebulous exception to the buffer zone for "necessary management activities taking place within the 100-foot buffer surrounding an identified natural resource." DEIR at 135 (an exception "is necessary because other aspects of the [Project] could require activities within the buffer zone"). As examples of what types of activities could fall within the exception, the DEIR explains that "[f]or example, exceptions to vegetation treatment within this standard buffer zone may be necessary for invasive species control and eradication, particularly where they pose a substantial threat to the sensitive resource, or for essential fire fuel management activities." DEIR at 134. Given that the main purpose of the Project is to conduct invasive species control and wildfire risk management, allowing incursions into the buffer zone for invasive species control and wildfire risk management defeats the entire purpose of having a "minimum 100 foot buffer zone" in the first place. This mitigation measure is illusory and unenforceable and thus

14-09 (cont.)

violates CEQA. § 21081.6(b).

14-10

Many of the mitigation measures designed to ensure that the Project's impacts to biological resources will be mitigated have not yet been formulated; their adequacy is thus unknown. For example, and for illustrative purposes only, the DEIR states that "MCOSD will prepare a treatment plan" for management activities within the 100-foot buffer, and that this treatment plan "will evaluate options for the protection and enhancement [sic], if appropriate, identify controls for avoiding and minimizing potential adverse effects on the sensitive natural resource, and include requirements for construction and post-construction monitoring." DEIR at 135. But the public has a right to comment on the efficacy of these mitigation plans. It violates CEQA to merely require compliance with a future plan whose contents are wholly unknown. *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1396. Mitigation measures for wetlands and wildlife habitat are similarly deferred. *E.g.*, DEIR at 140 (activities within 100 feet of a wetland are permitted subject to preparation of an unspecified "treatment program . . . to ensure careful controls are fully implemented and conditions adequately monitored"), 143 ("Any modifications to continuous vegetation cover will consider possible adverse effects on wildlife habitat values, and the MCOSD shall consider limiting excessive thinning or disruption of continuous canopy to native woodland and forest cover, if necessary to prevent significant impacts to native vegetation and wildlife habitat").

14-11

The DEIR's conclusion that impacts to biological resources will be mitigated to a less-than-significant level is contradicted by its admission that in some circumstances under the Project "disturbance to essential habitat of special-status species is unavoidable." DEIR at 134. Such an impact is "is *per se* significant." *Vineyard*, 40 Cal.4th at 449. This informational void is compounded by the lack of any concrete information about how MCOSD will avoid impacting special-status species when it exercises its unfettered discretion to ignore the 100-foot buffer zones. Without concrete mitigation plans that demonstrate to the public that such incursions indeed pose no risk of harm, there is no basis for concluding that "disturbance to essential habitat of special-status species" is a less-than-significant impact.

14-12

Finally, the DEIR's analysis of impacts to sensitive natural communities is inadequate to promote informed decision-making. The DEIR states that "quantification of potential impacts on existing biological resources is generally not possible," but it does not explain why. DEIR at 137. Moreover, the DEIR states that

> complete avoidance of these [sensitive natural communities] is not feasible, given the need to address invasive species infestations, provide fire fuel management, and implement other possible programs in the VBMP. In these instances, further controls must be developed by MCOSD to address any potential adverse effects and provide appropriate mitigation, where warranted, as called for in Mitigation

14-12

> Measures 5.1-1 (a) and 5.1-1 (b). This would include site-specific mapping, evaluation of options for treatment, consideration of the rarity of the sensitive natural community type, and implementing a compensatory mitigation program, if warranted.

DEIR at 138. Given that the DEIR could not quantify impacts to sensitive natural communities nor promise to avoid those communities when spraying pesticides nor even provide the public with any information about the "compensatory mitigation program" MCOSD plans to implement, its conclusion that impacts to these communities would be less-than-significant is wholly unfounded.

B. Hydrology and Water Quality

14-13

The DEIR fails to appropriately discuss the VBMP Project's water quality impacts, including impacts of pesticide applications on watersheds. It fails to adequately mitigate the Project's water resource impacts, and it incorrectly concludes that the VBMP Project's impacts will be mitigated to less-than-significant levels.

The DEIR sets a wholly inadequate pesticide buffer – one that fails to account for variations between different pesticides, topographic features and vegetative covers – and appears to state that even this buffer would not apply in all circumstances. As discussed above, there are instances where MCOSD will be applying chemicals much closer to the water, but the DEIR fails to adequately apprise the public of these instances. *E.g.* DEIR at 169.

14-14

As discussed more thoroughly in section V. D. Pesticide Hazards, it is unacceptable that the DEIR fails to discuss the risks of fluazifop-P-butyl to "reach[] surface water via runoff for *several months or more* after application" (as identified on the Fusilade DX and Fusilade II pesticide labels approved by the U.S. Environmental Protection Agency ("EPA")). The DEIR's water quality discussion overlooks the extreme risk of runoff posed by Fusilade DX and Fusilade II; and instead assumes that its indeterminate buffer will prevent harm.

14-15

The DEIR also incorrectly assumes that mitigation measures will prevent erosion and sedimentation impacts from reaching waterways. DEIR at 172-174. But the mitigation measures fail to address the impacts of the Project. Because the Project intends to remove and/or kill unwanted vegetation, it will interfere with the normal action of plant roots and foliage to keep soil from eroding. When plants are killed, their roots will no longer provide soil stability on steep slopes, and their foliage will no longer prevent rain and wind erosion of the newly exposed soil. This will happen even in areas where mechanical soil disturbance has not occurred, yet Mitigation Measure 5.2-2(b) targets only disturbed soils.

14-16

In addition, the DEIR's water quality analysis entirely fails to address the risks of groundwater contamination associated with the VBMP Project's use of pesticides. *See* DEIR at 147-176. Fusilade DX (and Fusilade II), Garlon 3A, Garlon 4 Ultra, Milestone, Transline, and Triclopyr 4E all risk contaminating groundwater, according to their EPA approved labels. In particular, fluazifop-P-butyl and clopyralid pose a heightened risk that the chemicals will leach or seep into groundwater, according to the EPA approved labels for Transline, Fusilade DX and Fusilade II. The DEIR must be revised and recirculated to address the impacts of pesticide applications on surface water quality, fish and wildlife health, soil erosion and sedimentation, and the risk that such applications could contaminate groundwater basins. Guidelines § 15088.5.

C. Geology and Soils

14-17

The DEIR acknowledges that MCOSD's preserves are located atop highly unstable slopes that present a "very severe erosion hazard" and are riddled with landslides. DEIR at 180-181, 189, 191. Protecting against further mobilization of soils is of paramount importance: the DEIR admits that "debris flows have resulted in devastating consequences to urban areas located downslope of preserve hillsides." DEIR at 189. But the DEIR contains only vague promises rather than enforceable measures to reduce these risks. This amounts to an end-run around CEQA's public participation requirements that cannot be countenanced.

For example, the DEIR's discussion of landslide hazards merely leaves the public guessing about what will be done. The DEIR concedes that "VBMP best management practices do not address slope hazards and unstable materials" even as it admits in the next sentence that "[i]mplementation activities that reduce static stability of sloped areas, particularly where fuel[]breaks are located, would result in hazardous landslide and debris flow conditions." DEIR at 190. To remedy this obvious deficiency, the DEIR states only that "[g]eologic hazards . . . shall be assessed and if present shall be taken into account." DEIR at 190. But how? Its only other requirement is that "[g]round disturbance in areas of identified landslide and debris flow hazards shall be performed in a manner to avoid reactivation of landslides or decreasing slope stability." *Id.* at 191. What manner is that? CEQA mandates that the public be given the answers to these questions now. *Gentry, supra*, 36 Cal.App.4th at 1396 (to "require the applicant to comply with any recommendations of a report that ha[s] yet to be performed . . . improperly defers the formulation of mitigation"). Here, the DEIR merely promises that at some undefined future date MCOSD will hire a geologist and comply with his or her recommendations to avoid repeat "devastating consequences to urban areas located downslope of preserve hillsides." DEIR at 189-191. This stratagem precludes the public from ensuring the adequacy of the DEIR's mitigation and accordingly violates the law. *Gentry, supra*, 36 Cal.App.4th at 1396.

The DEIR states that the type of soil under MCOSD's preserves contains serpentine, a

14-18

rock that it understatedly admits has a "unique chemistry." DEIR at 181-182. This "unique chemistry" includes asbestos, an *extremely dangerous* chemical that causes mesothelioma.[3] The Project's grading activities are likely to create dust. DEIR at 265. Are they thus likely to mobilize asbestos? The DEIR provides no discussion of this issue at all, and only identifies measures to *reduce* dust emissions, not *avoid* them. DEIR at 288. But even small amounts of asbestos-laden dust pose a significant public health concern. The DEIR must be recirculated with an assessment of this risk. Guidelines § 15088.5.

14-19

D. Pesticide Hazards

In at least six ways, the DEIR fails to appropriately analyze the significant ecological and human health risks associated with the 28 chemical treatment scenarios it evaluates. Therefore, it downplays the significant human health and environmental harms that will result from their use.

14-20

First, the DEIR indicates that the risk screening process data presented in DEIR Appendix E was developed by using the EPA's "OPP Ecotoxicity Database" to find "toxicity data for the active ingredient" in each pesticide. DEIR at 262. But *inert* ingredients in pesticides are not harmless. *See* 7 U.S.C. § 136 (a) & (m) (defining active and inert ingredients, respectively). Inert ingredients often alter the way that formulated products interact with the environment by allowing them to bind to surfaces and penetrate into areas they otherwise would not. Inert ingredients can be highly toxic, and often increase the toxicity of active ingredients.[4] Studies have shown that glyphosate formulations, for example, have worse impacts that glyphosate alone.[5] The DEIR also fails to address the ecological and health impacts of the surfactant that

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[3] *See, e.g., Should We Be Worried About Asbestos in Serpentine Rock?*, BayNature, *available at* https://baynature.org/articles/should-we-be-worried-about-asbestos-in-serpentine-rock/ ("The answer is yes, we actually should worry about exposure to the soil created from serpentine rock, especially airborne dust") (as visited July 7, 2015).

[4] C. Cox, M. Surgan, Unidentified Inert Ingredients in Pesticides: Implications for Human and Environmental Health, *Environmental Health Perspectives* (Dec. 2006) 114(12): 1803–1806. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1764160/ [accessed July 7, 2015].

[5] *Id.* Cox and Surgan note that:
1) "Peixoto (2005) found that a glyphosate formulation caused a significant reduction in the activity of rat liver mitochondrial respiratory complexes in vitro but that glyphosate alone had no effect." *Citing* F. Peixoto, Comparative effects of the Roundup and glyphosate on mitochondrial oxidative phosphorylation. Chemosphere. (2005); 61:1115–1122.
2) "In vitro treatment of human lymphocytes with glyphosate and a glyphosate formulation

14-20 (cont.)

will be mixed with the pesticides prior to application. *See* DEIR at 248. By examining only the

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resulted in a significantly higher rate of induction of sister chromatid exchange by the formulated product (Bolognesi et al. 1997). Both the formulation and glyphosate increased micronucleus formation in mouse bone marrow; the increase was "more pronounced" with the formulation." *Citing* C. Bolognesi, et al, Genotoxic activity of glyphosate and its technical formulation Roundup. *J Agric Food Chem* (1997);45:1957–1962.
3) "Inert ingredients may enhance the reproductive toxicity of active ingredients. Both the herbicide glyphosate and a glyphosate formulation were toxic to human placenta cell cultures (Richard et al. 2005). However, the formulation was significantly more toxic than glyphosate alone; the median lethal dose for the formulation was half that of the active ingredient." *Citing* S. Richard, et al, Differential effects of glyphosate and roundup on human placental cells and aromatase, *Environmental Health Perspectives* (June 2005); 113(6):716-20.
4) "In one study, a glyphosate-containing herbicide formulation inhibited progesterone production in vitro in mouse Leydig cells, but glyphosate did not (Walsh et al. 2000)." *Citing* Walsh LP, McCormick C, Martin C, Stocco DM. Roundup inhibits steroidogenesis by disrupting steroidogenic acute regulatory (StAR) protein expression. *Environmental Health Perspectives* 2000;108:769–776.
5) "Richard et al. (2005) noted that a glyphosate formulation inhibited the activity of human placental cell aromatase, which converts androgens into estrogens. Again, glyphosate alone did not inhibit the activity of this enzyme." *Citing* S. Richard, et al, Differential effects of glyphosate and roundup on human placental cells and aromatase, *Environmental Health Perspectives* (June 2005); 113(6):716-20.
6) "Toxic effects of some pesticide formulations on fish can be increased by the inert ingredients. One of the most commonly known examples is glyphosate; some formulations are 10–100 times more acutely toxic to fish than is the active ingredient alone (U.S. EPA 1993)." *Citing* U.S. EPA 1993. Registration Eligibility Decision (RED): Glyphosate. Washington, DC:U.S. Environmental Protection Agency. Available at: http://www.epa.gov/oppsrrd1/REDs/old_reds/glyphosate.pdf [accessed July 7, 2015].
7) "Howe et al. (2004) found that exposure of Rana pipiens tadpoles to environmentally relevant concentrations of glyphosate formulations reduced size at metamorphosis but increased time to metamorphosis, frequency of tail damage, and frequency of abnormal gonads. Glyphosate alone did not have these effects." *Citing* Howe CM. Toxicity of glyphosate-based pesticides to four North American frog species. *Environ Toxicol Chem*. 2004;23:1928–1938.
8) " Everett and Dickerson (2003) found that a glyphosate formulation was 100 times more toxic to ciliated protozoans than glyphosate." *Citing* Everett KDE, Dickerson HW. Ichthyophthirius multifilis and Tetrahymena thermophila tolerate glyphosate but not a commercial herbicidal formulation. *Bull Environ Contam Toxicol*. 2003;70:731–738.

14-20 (cont.)

toxicity of the active ingredients instead of the formulated products and the products as mixed for application, the DEIR and Appendix E have overlooked significant sources of environmentally damaging materials.

14-21

Second, the screening process improperly downplays the risks posed by Fusilade DX and/or Fusilade II. *See* DEIR E-67. Fusilade DX (which is only registered for *agricultural use* with the EPA) and Fusilade II (which is available for non-agricultural use) pose significant risks to watersheds, including groundwater. The EPA approved labels for Fusilade DX and Fusilade II (which both contain 24.5% fluazifop-P-butyl, the active ingredient) state that it can contaminate groundwater through leaching, and has “a high potential for reaching surface water via runoff for *several months or more* after application.” (Emphasis added). Further, these products are “highly toxic” to aquatic organisms, including amphibians, fish and invertebrates. Yet the screening process claims that there is a low risk of fluazifop-P-butyl products harming these organisms. DEIR E-67. Because these products can contaminate surface waters “several months or more after application,” the risk of such harm is much higher than the DEIR lets on.

14-22

Third, the DEIR improperly downplays and ignores the harms associated with Milestone (active ingredient aminopyralid (triisopropanolammonium salt)) and Transline (active ingredient clopyralid (monoethanolamine salt)). According to the EPA approved labels for these products, the urine and manure of animals that consume plants treated with these chemicals can cause unintended plant damage, as the pesticides concentrations in the animal waste remain high enough to cause damage. Thus, foliar applications of Milestone (which can also make poisonous plants more palatable to grazing animals) and Transline can be consumed by grazing deer (or goats brought in for fuel management), and then eliminated, without regard to application precautions to protect sensitive habitats and resources. As Milestone poses a significant risk to aquatic amphibians, and can make even poisonous plants enticing, it should not be included as part of the VBMP Project.

14-23

Fourth, the screening process improperly downplays the chronic toxicity of the chemicals considered as part of the VBMP Project. For example, it ignores the significant risk of harm from clethodim, the active ingredient in Envoy Plus. In a January 13, 2014, memorandum the EPA found that all uses of clethodim have potential direct chronic toxicity effects on fish and aquatic-phase amphibians.[6] Thus, while acute exposure to clethodim is considered practically

[6] C. Wendel, G. Orrick, *Clethodim: Preliminary Ecological Risk Assessment for Registration Review*, US EPA (Jan 13, 2014), pp. 1-2, as published at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2008-0658-0020 [accessed July 7, 2015]. Available for download at http://www.regulations.gov/contentStreamer?documentId=EPA-HQ-OPP-2008-0658-0020&disp

14-23 (cont.)

non-toxic to these aquatic organisms, prolonged exposure is likely to cause significant harms. The DEIR's screening process appears to address only the *acute* risks of clethodim on fish and thus incorrectly concludes that it is "[s]lightly toxic." DEIR E-11. The DEIR and Appendix E improperly fail to address the *chronic* toxicity of clethodim and any of the other chemicals in the VBMP Project, despite their significant harms to the environment. This omission must be addressed and the DEIR must be recirculated for public review and comment once its analysis is complete. Guidelines § 15088.5.

14-24

Fifth, the DEIR fails to account for the many harms associated with the use of glyphosate. Glyphosate – the active ingredient in Aquamaster/Roundup Custom and Rodeo – threatens human health, and environmental harm in several more ways than the significant impacts to fish, aquatic-phase amphibians and aquatic invertebrates discussed in the DEIR (DEIR at 265).[7] Glyphosate is extremely persistent, and can be detected at application levels months after application. Because glyphosate attacks the ability of plants and bacteria to synthesize aromatic amino acids, Monsanto has patented its use as an antimicrobial agent; its use interferes not only with target plants but also with soil bacteria (and bacteria inside anything that accidentally ingests its residue).[8] Healthy soil bacteria should be preserved – not jeopardized by glyphosate – to meet MCOSD's goals of native vegetation restoration.[9] Yet the DEIR does not mention these significant ecological risks. The DEIR also ignores glyphosate's risks to human health. In March 2015, the World Health Organization's International Agency for Research on Cancer

osition=attachment&contentType=pdf [accessed July 7, 2015].

[7] Indeed, given glyphosate's toxicity, it is possible that an unintended consequence of its use will be an increase in mosquitos in Marin County, as it *removes mosquito predators* from the food-chain.

[8] N. de María, et al., New insights on glyphosate mode of action in nodular metabolism: Role of shikimate accumulation, *J. Agric Food Chem.* (April 5, 2006) 54(7):2621-8; Monsanto Technology LLC, Missouri. Glyphosate formulations and their use for the inhibition of 5-enolpyruvylshikimate-3-phosphate synthase. 2010. US Patent number 7771736 B2. https://www.google.com/patents/US7771736.

[9] *See e.g.* McNear Jr., D. H. (2013) The Rhizosphere - Roots, Soil and Everything In Between. *Nature Education Knowledge* 4(3):1 (at the discussion of "Plant Growth Promoting Rhizobacteria (PGPR)"). Available at: http://www.nature.com/scitable/knowledge/library/the-rhizosphere-roots-soil-and-67500617 [accessed July 7, 2015].

14-24 (cont.)

("IARC") determined that glyphosate is "probably carcinogenic to humans."[10] It is suspected to cause miscarriages and abnormal fetal development, promote cell growth in breast-cancer cells, impact hormone levels, interfere with cytochrome P450 oxidase in the intestine and liver, and can impair the normal balance of intestinal microbes. The DEIR's failure to consider these potentially significant human health risks must be corrected.

14-25

Sixth, the DEIR states that all Notices of Pesticide application will be removed four days after application, as part of BMP-Invasive Plant-1. DEIR at 167, 255, 269, 286; see sample notice at DEIR E-94.[11] As discussed above, however, glyphosate, fluazifop-P-butyl, and other chemicals proposed for use in the VBMP Project will persist in the environment long after that four day period ends. Thus MCOSD's planned premature sign removal will expose sensitive receptors to higher levels of harmful chemicals, without any warning. Given that people use MCOSD's open-space preserves for picnicking, and berry harvesting, MCOSD's proposed mitigation cannot sufficiently reduce the harm of accidental pesticide exposure.

E. Fire Hazards

14-26

The DEIR fails to analyze significant aspects of the VBMP Project's fire hazards, and thus fails to find that the Project would "[e]xpose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands." DEIR at 221, 239. This is because the DEIR frames the issue as whether an "incomplete or insufficient" fuel management strategy will increase a risk of loss. DEIR at 237. But the DEIR fails to ask whether the use of pesticides in the VBMP Project will increase the combustion risks on treated lands. Glyphosate is a desiccant. This means it causes vegetation to which it is applied to dry out. Indeed, glyphosate is used to remove moisture from cultivated plants in order to harvest and store their seeds. Thus, any vegetative material that has been exposed to glyphosate is more likely to ignite, burn hot, and spread fire rapidly. Yet this wildlife risk is ignored in the DEIR. Further, glyphosate's persistence in the environment increases the likelihood that non-target plants will absorb at least some quantities of this dangerous dessicant, further increasing this fire risk. The DEIR's failure to address these significant fire hazards violates CEQA, and must be corrected in a recirculated DEIR. Guidelines § 15088.5.

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[10] *See* Joint FAO/WHO Meeting on Pesticide Residues (JMPR). Available at: http://www.who.int/foodsafety/areas_work/chemical-risks/jmpr/en/ [accessed July 7, 2015].

[11] NCRA notes that Appendix E's Table of Contents does not reflect the appropriate page numbers; the sample notice is located at DEIR E-94, not E-74.

F. Air Quality and Greenhouse Gas Emissions

14-27

The DEIR's analysis of air quality and greenhouse gas impacts is inadequate in four respects. First, the DEIR fails to meaningfully address whether the Project will cause odors. Second, the DEIR's incomplete analysis of the Project's greenhouse gas emissions is contrary to law. Third, the DEIR fails to address whether the Project's use of pesticides will cause a violation of air quality standards. Fourth, the DEIR's treatment of sensitive receptors is inadequate.

14-28

First, the DEIR fails to include information necessary to determine whether the Project's prescribed burns will "create objectionable odors affecting a substantial number of people." DEIR at 283. Two essential pieces of information are missing. First, with respect to the question whether MCOSD's burns have historically caused odor complaints, the DEIR states only that there "is no record of complaints about odor *which can be characterized as substantial or frequent*." DEIR at 283 (emphasis added). But is there *any* record of complaints, which is the operative question in light of the past frequency of controlled burns? The DEIR must provide information on how many odor complaints have been filed in the past and describe each such complaint. Second, the DEIR states that the Project "is not anticipated to increase the *frequency* of prescribed burns," but it contains no information about whether the *scope* of the prescribed burns that do occur will increase. *Id.*

14-29

Second, the DEIR's analysis of the Project's greenhouse gas emissions is inadequate for three reasons. Most fundamentally, the DEIR excuses itself from performing a detailed analysis of the Project's greenhouse gas emissions on the basis that the "BAAQMD CEQA Air Quality Guidelines do not include quantified thresholds for temporary activities such as construction." DEIR at 204. But under CEQA the rule is that "in preparing an EIR, the agency must consider and resolve every fair argument that can be made about the possible significant environmental effects of a project, irrespective of whether an established threshold of significance has been met with respect to any given effect." *Protect the Historic Amador v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109. "[T]hresholds cannot be used to determine automatically whether a given effect will or will not be significant." *Id.* at 1108-1109. MCOSD must project the Project's greenhouse gas emissions and then explain whether those impacts are or are not significant.

14-30

The DEIR also improperly lacks enforceable mitigation for the Project's greenhouse gas emissions. It contains only platitudes: the Project "contains strategies for supporting the adaptation of natural systems to climate change and the consideration of ecosystem carbon storage in making vegetation management decisions." What are these strategies? Why is "consideration of ecosystem carbon storage" a mere "support[ed]" "strateg[y]" rather than a mandatory obligation? Lacking substance, the DEIR does not say. It should be revised to

14-30 mandate that all of the Project's greenhouse gas emissions be eliminated by using electric rather than diesel motor vehicles and equipment, or otherwise offset.

14-31 The DEIR's analysis of greenhouse gases is also inadequate because it assumes without any explanation at all that Project implementation "is consistent with the requirements of Assembly Bill 32, which mandates a reduction of GHG emissions by 15 to 20 percent from 1990 levels by the year 2020." DEIR at 284. But the DEIR admits that the Project's ongoing management activities will cause greenhouse gas emissions, and those management activities will occur in 2020, so the justification (if any) for concluding that the Project will not impair, at least to some degree, the state's goal of dramatically reducing greenhouse gas emissions by that date is not immediately apparent. To the contrary, it appears that the Project will impede achievement of this laudable goal. The DEIR fails to show otherwise. Thus, its analysis fails to support its conclusions.

14-32 Third, the DEIR's discussion of whether the Project will contribute to air quality violations is incomplete. It contains no information on whether the Project's pesticide use will cause violations of air quality standards. Many of the pesticides that will be used contain volatile organic compounds, including but not limited to Envoy plus (clethodim), Fusilade DX/Fusilade II (fluazifop-P-butyl), Triclopyr 4E (triclopyr (triethylamine salt)), Garlon 4 Ultra (triclopyr (triethylamine salt), and Poast (sethoxydim). They may also contain particulate matter, such as PM10 and PM2.5. The DEIR must be revised to include this crucial information about the air quality impacts of pesticides.

14-33 Fourth, the DEIR's treatment of sensitive receptors is inadequate. The EIR contains no information about approximately how many sensitive receptors are located near its preserves or whether any particular facilities that are especially likely to contain sensitive receptors, such as schools or nursing homes, are adjacent to its lands. It merely states that "[s]ome sensitive receptors may be located adjacent to MCOSD preserves." DEIR at 289. For the same reason, the DEIR's mitigation measures are inadequate. The DEIR makes no attempt to mitigate the impacts of fires and pesticides on those who are especially sensitive to health risks. It could not provide as mitigation a requirement that pesticides cannot be sprayed at locations near sensitive receptors, because MCOSD does not know – or at least, its DEIR fails to show – where those sensitive receptors are. Instead, the DEIR relies upon the general mitigation for ordinary hazards, such as best management practices for invasive species and fuel management. *Id.* Compliance with general air quality standards does not ensure that particularly sensitive receptors will be protected, yet the DEIR incorrectly assumes just that.

14-34

G. Noise

The DEIR contrasts the VBMP Project's noise impacts with those of construction

14-34 (cont.)

activities. DEIR at 300-301. The DEIR concludes that the VBMP Project's noise impacts will not exceed the County's significance thresholds. DEIR at 298-301. But the County's noise thresholds for construction activities in the built environment are not the appropriate measure of the noise impacts of the VBMP Project in its wildland context. The appropriate question is not whether the VBMP Project's noise impacts conflict with a threshold, but whether they will be significant under CEQA. *Protect The Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 11108-1109. Here, the answer to that question is yes.

The Marin County Open Space District Code ("MCOSD Code"), which is Appendix A to the Marin County Code, restricts noise within the preserve system by prohibiting or criminalizing a wide range of activities. *See e.g.* MCOSD Code § 02.01.050 (misdemeanors and infractions). Thus, the MCOSD Code prohibits the following activities within its preserves:

- motorized vehicles and vessels (MCOSD Code §§ 02.04.010, 02.04.030)
- "any loud, unnecessary or unusual noise which disturbs the peace and quiet within any area within the district," and the "operat[ion] or posess[ion] of any pubic address system, amplified musical instrument or other noise-producing or transmitting device on district lands" (MCOSD Code § 02.02.100)
- groups of twenty or more participants conducting any activities without prior approval (MCOSD Code §02.02.040)
- organized "running, jogging or cross-country meets, events, or practice sessions" without prior approval (MCOSD Code § 02.02.070)
- organized games like "volleyball, baseball, softball, soccer, football and other similar organized sports" (MCOSD Code § 02.02.080(A))
- "loud or disturbing conduct or any act tending to a breach of the peace" (MCOSD Code § 02.02.170(D)
- any "noisy . . . dog or other animal" (MCOSD Code § 02.05.010 (d)).

For these reasons, as the MCOSD admits, its "preserves are quiet areas." DEIR at 300. When compared to the ambient noise within the open space preserves, the VBMP Project's use of trucks, weed eaters, brush cutters, chain saws, mowers, small excavators, and all-terrain vehicles will be a jarring contrast. *See* DEIR at 300-301. Thus, despite the DEIR's claims, the VBMP Project *will* "generate a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project" and thus *will* have a significant noise impact. *See* DEIR at 298. The DEIR's conclusion to the contrary is plainly unsupportable.

14-35

H. Visual Quality

The MCOSD's preserve system plays a critical role in maintaining the visual character of Marin County. The open spaces, including the upland greenbelt and ridge areas, provide

14-35 (cont.)

extraordinary viewsheds throughout much of the County. The DEIR and VBMP fail to protect these unsullied views. The DEIR states that the VBMP Project's visual resource impacts will be less-than-significant and that no mitigation measures are required. DEIR at 313-314. But to reach this conclusion, the DEIR makes several analytical leaps unsupported by the facts.

First, the DEIR does not distinguish between existing and planned fuel breaks in its discussion of their location. DEIR at 216. Yet the appropriate baseline for analyzing the Project's impacts does not include hypothetical fuel breaks that may occur, but instead those that already exist. *Communities For a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 322. Without a clear understanding of the baseline condition, it is impossible to assess how the VBMP Project will *alter* that condition.

Second, the DEIR states that the VBMP Project's "creation of new fuel breaks, thinning of vegetation for defensible space, and the removal of non-native vegetation may have short term visual impacts" but incorrectly assumes that vegetation will grow back and render these impacts less-than significant. DEIR at 312-313. Yet the very purpose of a fuel break – an area where "vegetative fuels have been removed" – is to *maintain* an area where fire cannot easily spread. DEIR 67; VBMP at 3-35 (a fuel break is a "permanent facility requiring ongoing maintenance"). The ongoing activities under the VBMP will include creating and maintaining fuel breaks, which will range from 60 to 200 feet wide, for primary and secondary breaks. DEIR at 67-68. In addition, the VBMP Project contemplates new "wide-area fuel[ ]breaks on the borders of preserves near residential communities." DEIR at 68. The VBMP states that these breaks "cover large areas of land, not necessarily located near roads." VBMP at 3-33. These new wide-area fuel breaks are in addition to the existing fuel breaks, all of which will be managed differently under the VBMP Project. DEIR at 67-68. These additional fuel breaks are *not* individually addressed as part of the DEIR's discussion of visual quality, despite proposed removal of vegetation in these "large areas of land." Indeed, the two examples of wide-area fuel breaks provided in the DEIR are 22 acres, and 20.1 acres respectively (when adding a proposed fuel break to an existing one). *See* DEIR at 227-228, (Figures 5.4-13, 5.4-14).

The DEIR thus mischaracterizes and ignores the significant visual resource impacts of the VBMP Project. Because the VBMP will convert "large areas of land" that are currently vegetated to permanent areas that will be maintained with "vegetative fuels" *removed*, the DEIR's conclusion that any visual impacts would not be a "permanent" alteration is incorrect. DEIR at 312-313. Further, the DEIR incorrectly downplays vegetation removal's "permanent changes to preserve area[s]" by assuming such changes are "superficial in nature" and lacking "substantial effect on visual quality." DEIR at 314. These vast denuded areas, which will be visible from neighborhood homes, are permanent alterations to the visual landscape. The DEIR must be revised to fully disclose, analyze, and where feasible, mitigate the VBMP Project's significant visual resource impacts.

I. Cultural Resources

14-36

The EIR acknowledges that the Project's grading and soil disturbance could cause the destruction of "unidentified buried other or otherwise obscured cultural or historic resources." DEIR at 321. Its mitigation measures provide that the Federated Indians of the Graton Rancheria will recommend "a state-qualified archeologist or an archeological consultant" to develop "proposals for any procedures deemed necessary." *Id.* at 321-322. This mitigation measure must be revised to require formal notification of the State Office of Historic Preservation.[12] The mitigation measures go on to provide that if "discovered artifacts are considered prehistoric consultation with interested Native American groups is advised." *Id.* at 322. To meet CEQA's requirement that mitigation be enforceable, this mitigation measure must be revised to both *mandate* such consultation and specify who will be consulted if no other groups come forward. § 21081.6(b). Finally, the DEIR should disclose whether local Native American groups utilize MCOSD preserves for cultural activities and, if so, the extent to which the Project will affect such uses. §§ 21080.3.1, 21074.

J. Cumulative Impacts

14-37

"One of the most important environmental lessons evident from past experience is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant, assuming threatening dimensions only when considered in light of the other sources with which they interact." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720. An adequate cumulative impacts analysis is essential to the CEQA process:

> It is vitally important that an EIR avoid minimizing the cumulative impacts. Rather, it must reflect a conscientious effort to provide public agencies and the general public with adequate and relevant detailed information about them. A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decisionmaker's perspective concerning the environmental consequences of the project, the necessity for mitigation measures, and the appropriateness of project approval. An inadequate cumulative impact analysis does not demonstrate to an apprehensive citizenry that the governmental decisionmaker has in fact fully analyzed and considered the environmental consequences of its actions

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[12] Additionally, the State Office of Historic Preservation should be added to the list of responsible agencies. DEIR at 75.

14-37 (cont.)

Citizens to Preserve the Ojai v. County of Ventura (1985) 176 Cal.App.3d 421, 431. Here, the DEIR's cursory cumulative impact analysis had precisely this pernicious effect. It is devoid of any meaningful information and thereby improperly "impedes meaningful public discussion and skews the decisionmaker's perspective." *Id.*

The DEIR repeatedly acknowledges both the Project's potentially significant impacts and the already compromised environment of Marin County. But it concludes without explanation that the Project will not make a meaningful contribution to further environmental deterioration. For example, the DEIR states that the cumulative effect of development in Marin County under the General Plan from which the Project is tiered is a "cumulatively significant" "loss of undeveloped habitat and possible further fragmentation of the remaining natural areas." DEIR at 360. As noted above, the DEIR also takes the position that in some cases "impacts on sensitive natural resources are unavoidable." *Id.*; *see also* DEIR at 134. Yet the DEIR concludes without any explanation at all that "with the adoption of recommended mitigation measures . . . implementation of the VBMP would not make a cumulatively considerable contribution to the identified cumulative impact to biological resources."

But the DEIR's facile claims of insignificant impacts conflict sharply with its underlying analysis. The DEIR's mitigation measures purport only to *mitigate*, not *avoid*, the Project's impacts on biological resources.[13] Consequently, the Project will make *some* contribution to a cumulatively significant impact. The DEIR's conclusion that the Project's incremental contribution is so minor as to be insignificant is wholly unsupported by the facts and analysis CEQA requires. CEQA mandates that the EIR contain information sufficient to allow the public to trace the agency's analytical path from evidence to conclusion. *Laurel Heights Imp. Ass'n v. Regents of University of California* (1988) 47 Cal.3d 376, 404. Moreover, under CEQA, even a "de minimis contribution" to an existing cumulative impact may be significant. *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 117-121; *see also* § 21083(b)(2) ("individually limited" impacts may still be "cumulatively considerable"); Guidelines § 15065(a)(3) (same).

The rest of the cumulative impact analysis suffers from the same flaw. For example, the

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[13] Indeed, these mitigation measures are inadequate even to do that, because the primary means of mitigation the DEIR relies upon is a 100-foot buffer zone that is subject to incursion whenever MCOSD feels the need to conduct management activities near special-status species and sensitive natural resources. *Compare, e.g.,* DEIR at 135 (allowing pesticide spraying within the buffer) *with* DEIR at 171 ("The 100 foot buffer would provide for substantial degradation or sequestering of any herbicide ingredients or byproducts through both soil, plant/litter and water contact").

14-37 (cont.)

DEIR admits that the Project will "result[] in a significant impact by exceeding water quality standards" yet nonetheless concludes that the Project will "not make a cumulatively considerable contribution to the identified cumulative water and hydrology impacts" merely because the DEIR promises to mitigate impacts to water quality to some unstated degree. DEIR at 361-362. The discussions of impacts to geology and soils, fire hazards, air quality, noise, and visual quality are equally obscure and just as unlawful.

Where the DEIR does provide detailed reasons for its conclusions, those grounds are specious. For example, the DEIR states that pesticide spraying will not have significant cumulative impacts because of (1) pesticide degradation, (2) the localized nature of applications, and (3) the "low toxicity of herbicides." DEIR at 364-365. However, as discussed above, many of the pesticides that will be used linger in the environment for months or weeks, these pesticides can easily mobilize into groundwater basins, and they are highly toxic to amphibians and other aquatic species. The environmental and human health hazards caused by the use of pesticides will have significant cumulative impacts, particularly in light of the fact that Marin County's waterbodies are already designated as being excessively impaired by pesticides.

V. The Mitigation Measures Are Unlawfully Deferred

14-38

"Mitigating conditions are not mere expressions of hope." *Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508. "Formulation of mitigation measures should not be deferred." Guidelines § 15126.4(a)(1)(B). CEQA requires the DEIR to discuss "each" possible mitigation measure and "the basis for selecting a particular measure should be identified." *Id.* "[R]equir[ing] . . . the . . . adopt[ion of] mitigation measures recommended in a *future* study is in direct conflict with the guidelines implementing CEQA." *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 306 (emphasis added). "Mitigation measures must be fully enforceable." Guidelines § 15126.4(a)(2); *see also* § 21081.6(b)

Here, the DEIR violates all of these requirements. It unlawfully defers the creation of enforceable mitigation measures in most instances. For example, as discussed above, when addressing landslide risks the DEIR states only that "[g]eologic hazards . . . shall be assessed and *if present* shall be taken into account." DEIR at 190 (emphasis added). Further, when discussing the impact of Project activities on sensitive resources (such as water bodies or special status species) the DEIR states that "[a] certain degree of flexibility on the part of MCOSD is required in order to accomplish biodiversity and invasive plant control objectives. So the degree of applied constraints on herbicide use must be weighed against the costs of allowing irreparable spread of invasive plants and a decline in the diversity of native plant and animal communities." DEIR at 169; *see also* DEIR at 134. Thus, the DEIR states that, despite its selection of a 100 foot buffer zone around sensitive natural resources, "exceptions to treatment within this standard

14-38 (cont.)

buffer zone may be necessary." DEIR at 169. But the DEIR fails to inform the public – or decisionmakers – as to the specific standards that would trigger these exceptions, their associated environmental impacts, and whether and how these impacts would be mitigated to a less-than-significant level. *See, e.g.*, DEIR at 134-135, 140, 143, 169, 265-267. The DEIR must be recirculated with clearly defined and enforceable mitigation measures for all mitigable impacts, and make clear which impacts cannot be feasibly mitigated, and why.

14-39

VI. Conclusion

The DEIR provides woefully deficient disclosure and analysis of its widespread and pervasive impacts on human and environmental health and safety. Because it is profoundly inadequate in the respects discussed above, it must be substantially revised and recirculated.

Very truly yours,

Stephan C. Volker
Stephan C. Volker
Attorney for North Coast Rivers Alliance

RESPONSE TO COMMENT LETTER 14 - STEPHAN C. VOLKER, NORTH COAST RIVERS ALLIANCE, JULY 8, 2015

Response to Comment 14-1

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion of alternatives and the herbicide-free approach.

Response to Comment 14-2

See Response to Comment 14-07.

Response to Comment 14-3

The commentor states that the TPEIR's tiering strategy violates CEQA's requirements. The concept of "tiering" as described in the *State CEQA Guidelines* is described on page 6 of the Draft TPEIR. As described on page 6 of the Draft TPEIR the Vegetation and Biodiversity Management Plan meets the CEQA requirements for a second-tier project. Thus the TPEIR's tiering strategy is appropriate.

Response to Comment 14-4

See Response to Comment 14-19.

Response to Comment 14-5

The Draft TPEIR does not defer the formulation of mitigation measures to a future date. Please see **Master Response 12 - Deferral of Analysis and Mitigation** for a full discussion of the issue.

Response to Comment 14-6

Please see Master Response 3 – Alternatives to Herbicide Use and Response to Comment 11-39 for a discussion of the range of alternatives considered in the Draft TPEIR and the No Herbicide Alternative.

One of the concerns regarding the alternative analysis was that there was an unfair comparison of the alternatives due to the exclusion of BMPs in Alternatives 2 and 3. In response to this comment the text on page 338 of the Draft TPEIR and **Exhibit 6.1-3** are revised as follows:

> **Exhibit 6.1-3** provides an impact evaluation for each impact identified in the Draft TPEIR under each alternative. In the following exhibit, for the draft VBMP (the proposed project) "LTS" denotes impacts determined to be less-than-significant. "S" denotes significant impacts that would be reduced to less-than-significant with implementation of mitigation measures. "SU" denotes significant unavoidable impacts (i.e. impacts that would not be reduced to less-than-significant with implementation of mitigation measures). The three alternatives are evaluated compared to the proposed project in terms of "less impact", "similar impact" and "greater impact". *Alternative 1 is* a continuation of existing practices. With the continuation of existing practices it would not be assured that the BMPs included in the draft VBMP would be implemented, thus they are not assumed in the evaluation of *Alternative 1*. In regard to the analysis of *Alternative 2* or *Alternative 3* it is assumed that best management practices similar to those included in the draft VBMP would be implemented.~~, should either~~ *Alternative 2* ~~or~~ *Alternative 3* ~~be selected it is assumed that it~~

~~would be necessary for MCOSD to adopt best management practices and mitigation measures similar to those for the proposed project.~~

Exhibit 6.1-3
Comparison Evaluation of Draft VBMP and Alternatives

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
Biological Resources				
5.1-1 - Special-Status Species	S – Implementation of VBMP could result in the loss of populations or essential habitat for special-status species.	Greater impact - Continuation of existing programs would not provide a coordinated approach to resource management on all MCOSD lands, and could lead to loss of occurrences of special-status species as a result of limited coordination.	Greater impact - Minimal management could result in loss of occurrences of special-status species as a result of continued spread of invasive species and other adverse conditions.	Greater impact – Increased focus on fire fuel management could result in increased impacts to essential habitat for special-status species. ~~with no clear BMPs for avoidance and protection.~~ <u>Implementation of BMPs would assist in avoidance and protection of special-status species but impact would still be greater than for proposed project.</u>
5.1-2 - Sensitive Natural Communities	S – Management activities could result in loss or damage to sensitive natural communities.	Greater impact - Continuation of existing programs would not provide a coordinated approach to resource management on all MCOSD lands, and could lead to further degradation of sensitive natural	Greater impact - Minimal management could result in further compromise of sensitive natural communities as invasive species would continue to spread and displace natural cover.	Greater impact – Increased focus on fire fuel management could result in increased impacts on sensitive natural communities ~~with no clear BMPs~~

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
		communities as a result of limited coordination.		~~for avoidance and protection~~. <u>Implementation of BMPs would assist in avoidance and protection of special-status species but impact would still be greater than for proposed project.</u>
5.1-3 – Wetlands and Other Waters	S – Management activities could result in modification to wetlands and other waters. Implementation of revised BMPs would ensure adequate protection wetlands and other waters.	Less impact – Adverse impacts on jurisdictional waters are not anticipated with continuation of existing programs.	Less impact – Adverse impacts on jurisdictional waters are not anticipated with minimal management.	Greater impact – Increased focus on fire fuel management could result in increased impacts on jurisdictional waters ~~with no clear BMPs for avoidance and protection~~. <u>Implementation of BMPs would assist in protection of jurisdictional waters but impact would still be greater than for proposed project.</u>
5.1-4 -Wildlife Habitat and Movement Opportunities	S – Management activities would generally minimize	Greater impact- Continuation of existing programs would not provide a coordinated	Greater impact – Invasive species spread would further compromise	Greater impact – Increased focus on fire fuel

Impact	*Level of Impact for Draft VBMP*	*Level of Impact of Alternative 1 (No Project)*	*Level of Impact of Alternative 2 (Minimal Management)*	*Level of Impact of Alternative 3 (Risk Reduction)*
	disturbance to important wildlife habitat features and wildlife movement opportunities, although mitigation would be required to ensure adequate protection.	approach to resource management on all MCOSD lands, and could lead to further degradation of important wildlife habitat features as a result of limited coordination.	existing wildlife habitat values on MCOSD preserves.	management could result in increased impacts on important wildlife habitat features ~~with no clear BMPs for avoidance and protection~~. Implementation of BMPs would assist in reducing impacts on wildlife habitat features but impact would still be greater than for proposed project.
Hydrology and Water Quality				
5.2-1 - Water Quality Standards or Waste Discharge Requirements	S - Potential for herbicide application during rainy season when stormwater runoff could mobilize herbicides and/or their by-products and convey to ponds, lakes, or creeks. Herbicide applications may be required to prevent invasive plant infestations associated with road or trail maintenance or	Greater impact - Continuation of existing herbicide practices without protective measures contained in new BMPs would result in significant impacts. This conclusion is based on the risk screening analysis contained in Section 5.5, which does not conclude that actual impacts would occur, but rather provides a model of assessment evaluating application, toxicity, and exposure	Greater impact - Vegetation management projects that include herbicide use, and could have an impact on water quality and waste discharge requirements would still occur under the *Alternative 2*. Herbicide use is considered more cost effective and could become the preferred use under *Alternative 2*. However with *Alternative 2* there would be no	Greater impact - For *Alternative 3*, the focus on invasive plant control and fire risk would likely result in frequencies and total area of herbicide application similar to that assessed for the draft VBMP. While herbicide treatments could increase relative to the VBMP with

Impact	*Level of Impact for Draft VBMP*	*Level of Impact of Alternative 1 (No Project)*	*Level of Impact of Alternative 2 (Minimal Management)*	*Level of Impact of Alternative 3 (Risk Reduction)*
	downsizing in the presence of roadside ditches conveying minor spring or seep discharge.	sensitivity in order to determine any potential impact that could occur, absent further risk screening.	mitigation measures to minimize risk of contamination.	respect to the more aggressive defensible space zone (DSZ) management proposed, broader invasive plant control could decrease as they would be subject to the availability of grant funding.
5.2-2 - On-Site and Off-Site Erosion and Sedimentation	S - Soil erosion and subsequent sedimentation could result when vegetation removal occurs where soil integrity is adversely affected by condition that could include mechanical equipment removal, highly compacted soils, and substantial root removals. Mitigation Measure 5.2-2 requires implementation of BMP-Hydrology and Water Quality (new) *Erosion Control Measures* to mitigate this impact.	Greater impact - Vegetation management would still occur without a VBMP. However without erosion control measures of the VBMP, erosion and sedimentation impacts caused by vegetation removal would not be mitigated, therefore resulting in a greater impact.	Greater impact - Vegetation removal activities causing erosion and sedimentation would still occur. Prioritization of projects to minimize overall management would result in larger project sites and fewer projects. ~~Without the VBMP no new BMPs to help reduce erosion and sedimentation would be implemented, resulting in greater impact when compared to proposed project with mitigation measures.~~ Similar to the proposed project, BMPs would help to reduce erosion and	Greater impact - Aggressive management of vegetative fuels to create DSZs along the urban wildland interface would likely increase erosion and sedimentation impacts relative to the proposed project~~, with no new BMP to address this impact.~~ Similar to the proposed project, BMPs would help to reduce erosion and sedimentation

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
			sedimentation impacts but mitigation would still be required.	impacts but mitigation would still be required.
5.2-3 - Degraded Water Quality and Substantial Additional Sources of Polluted Runoff	S - Based on the analysis in Section 5.5 Hazards - Herbicide Use and the potential for wet season applications there is the potential for sources of polluted runoff reaching sensitive water resources.	Greater impact - With continuation of current programs, and no benefit from BMPs to reduce pollution the potential for degraded water quality and substantial additional sources of polluted runoff would exist.	Greater impact - Herbicide use for vegetation management is cost effective. The minimal management alternative would involve a more extensive use of herbicides. ~~Without BMPs of the VBMP and new/revised BMPs required by mitigation in the TPEIR under *Alternative 2*herbicide use would significantly impact water quality~~. Even with BMPs *Alternative 2* would significantly impact water quality.	Greater impact - Some management activities would include herbicide use. ~~Lacking the new BMPs proposed with the VBMP, no mitigation would reduce this impact.~~ Even with BMPs *Alternative 3* would significantly impact water quality.
Geology and Soils				
5.3-1 - Slope instability and landsliding	S - Management activities would decrease slope stability which could possibly result in new landslides or debris flows in sloped areas. Also potential to reactivate existing landslides.	Greater impact - Greater severity would result without geotechnical construction BMPs to reduce landslide and debris flow hazards.	Similar impact - ~~It is likely~~ BMPs would be implemented that would require assessment of geologic hazards and construction methods that reduce the risk landslide and debris flow activation.	Similar impact - ~~It is likely~~ BMPs would be implemented that would require assessment of geologic hazards and construction methods that reduce the risk landslide and debris

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
				flow activation.
5.3-2 - Soil Erosion	S - The draft VBMP includes activities that could cause soil erosion and sedimentation. Eroded soils could contribute to sedimentation in downstream waterways.	Similar impact - Continuation of existing programs under the *No Project Alternative* would continue to include projects that could cause soil erosion and sedimentation similar to the proposed project.	Less impact - Under *Alternative 2* the TAC could prioritize projects addressing erosion and top soil loss in response to identified problem areas. This management technique considered reactive to developing conditions could prevent significant problems from occurring as result of erosion.	Greater impact - Projects that minimize wildfire risks and invasive plant populations would be prioritized. There would be the need for mitigation to control soil erosion and sedimentation.
Hazards - Fire Hazards				
5.4-1 - Implementation of the draft VBMP's strategies involving defensible space, wide-area fuelbreaks, and ignition prevention zones.	LTS - Implementation of the draft VBMP's strategies involving defensible space, wide-area fuelbreaks, and ignition prevention zones would have a positive effect at reducing wildfire risks and hazard. These actions would increase vegetative fuel treatments at the wildland-urban interface, where people and assets are most vulnerable to wildfire,	Similar impact - Existing programs would continue. MCOSD would coordinate with Marin fire agencies to develop strategies collaborating fire risk reduction with other preserve management objectives.	Greater impact - Funding and availability of staff would dictate the extent of fire hazard reduction strategies that are implemented.	Similar impact - Projects would be prioritized in order to reduce fire risks and manage invasive plants. Extensive implementation of wide-area fuelbreaks is likely.

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
	resulting in an overall benefit.			
5.4-2 - Insufficient implementation of the combination of strategies contained in the draft VBMP could decrease the existing wildfire protection,	S - Insufficient implementation of the combination of strategies contained in the draft VBMP, including fuel reduction along the wildland urban interface, strategic construction and management of primary and wide area fuelbreaks, ingress/egress zones, and ignition prevention zones, could decrease the existing wildfire protection, therefore, increasing exposure of people or structures to a significant risk of loss, injury, or death.	Less impact - Under the *No Project Alternative* the MCOSD would have less hands on fire fuel reduction. MCFD would continue to implement fire risk management and flashy fuels reduction according to its strategies in its *Strategic Fire Plan*.	Similar impact - More fire management areas would be treated that require less follow up near preserve boundaries, shifting away from traditional strategies implemented by MCFD. Need to coordinate implementation of the combination of strategies similar to proposed project.	Similar impact - MCOSD staff would work with MCFD in working with residents to increase defensible space zones. Likely a reduction in existing fuelbreak system and establishment of selective wide area fuelbreaks. Need to coordinate implementation of the combination of strategies similar to proposed project.
5.4-3 - Implementation of the VBMP would require the use of equipment that could introduce additional ignition hazards to otherwise untreated areas.	S - Implementation of the VBMP would require the use of equipment that could introduce additional ignition hazards to otherwise untreated areas. Vegetation treatment could also result in the	Greater impact - With the *No Project Alternative* ~~would lack the benefits of mitigation 5.4-3 and~~ any existing ignition risk would continue.	Less impact - There would be a reduction of scope of work and relative decrease in ignition potential.	Less impact - The focus of *Alternative 3* is risk reduction that would likely include reducing risk ignition potential.

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
	conversion of less flammable fuels to vegetation that is susceptible to sparks, such as dry grass. Cutting grass prior to its curing can also result in the accumulation of dry material. Additional burning of material from cutting broom poses a small risk of escape.			

Impact	*Level of Impact for Draft VBMP*	*Level of Impact of Alternative 1 (No Project)*	*Level of Impact of Alternative 2 (Minimal Management)*	*Level of Impact of Alternative 3 (Risk Reduction)*
Hazards - Herbicide Use				
5.5-1 - Impacts to Ecological Receptors	S – For non-plant ecological receptors, 22 of the 28 application scenarios evaluated showed no or less-than-significant impacts. A significant impact was concluded for six scenarios. Mitigation 5.5-1 includes revisions to BMP-Invasive Plant-2 detailing implementation of a 100-footbuffer zone near sensitive natural resources to reduce all non-plant ecological receptor exposures to less-than-significant levels.	Greater impact – Without project implemented BMPs designed to limit exposure, such as implementing 100-footbuffer zones or using least harmful application methods, significant potential exists for non-plant ecological receptor exposure to hazardous levels of herbicide during routine applications.	~~Greater impact –Same as *Alternative 1*. Without project implemented BMPs designed to limit exposure, such as implementing 100-foot buffer zones or using least harmful application methods, significant potential exists for non-plant ecological receptor exposure to hazardous levels of herbicide during routine applications.~~ <u>Similar impact - As with the proposed project even with BMPs, such as those designed to limit exposure by implementing a 100-foot buffer, significant impacts would occur. Additional mitigation would be required.</u>	~~Greater impact – Same as *Alternative 1*. Without project implemented BMPs designed to limit exposure, such as implementing 100-foot buffer zones or using least harmful application methods, significant potential exists for non-plant ecological receptor exposure to hazardous levels of herbicide during routine applications.~~ <u>Similar impact - As with the proposed project even with BMPs, such as those designed to limit exposure by implementing a 100-foot buffer, significant impacts would occur. Additional mitigation would be required.</u>
5.5-2 - Applicator and Preserve User Exposure	LTS - With the following of label requirements,	Similar impact - It is assumed that MCOSD would continue	Similar impact - It is assumed that MCOSD	Similar impact - It is assumed that

Impact	*Level of Impact for Draft VBMP*	*Level of Impact of Alternative 1 (No Project)*	*Level of Impact of Alternative 2 (Minimal Management)*	*Level of Impact of Alternative 3 (Risk Reduction)*
	PCA recommendations, and implementation of pertinent BMPs in the VBMP herbicide exposure to human receptors (applicator and preserve user) would be a less-than-significant impact.	to follow label requirements, PCA recommendations, notification of herbicide use so that exposure to human receptors (applicator and preserve user) would be a less-than-significant impact.	would continue to follow label requirements, PCA recommendations, notification of herbicide use so that exposure to human receptors (applicator and preserve user) would be a less-than-significant impact.	MCOSD would continue to follow label requirements, PCA recommendations, notification of herbicide use so that exposure to human receptors (applicator and preserve user) would be a less-than-significant impact.
5.5-3 - Non-Target Plant Exposure to Rope Wick & Foliar Applications	S – If present at the site of application, non-target plant ecological receptors may also be exposed to hazardous amounts of herbicide during foliar or rope wick applications.	Greater impact – Without project implemented BMPs designed to limit exposure, such as implementing 100-foot buffer zones or using least harmful application methods, significant potential exists for non-target plant ecological receptor exposures to hazardous levels of herbicide during routine applications.	~~Greater impact –Without project implemented BMPs designed to limit exposure, such as implementing 100-foot buffer zones or using least harmful application methods, significant potential exists for non-target plant ecological receptor exposures to hazardous levels of herbicide during routine applications.~~ <u>Similar impact - If present at the site of application, non-target plant ecological receptors may also be exposed to hazardous</u>	~~Greater impact – Same as for *Alternative 1*. Without project implemented BMPs designed to limit exposure, such as implementing 100-foot buffer zones or using least harmful application methods, significant potential exists for non-target plant ecological receptor exposures to hazardous levels of herbicide during routine applications.~~

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
			<u>amounts of herbicide during foliar or rope wick applications. Additional mitigation would be required</u>.	<u>Similar impact - If present at the site of application, non-target plant ecological receptors may also be exposed to hazardous amounts of herbicide during foliar or rope wick applications. Additional mitigation would be required.</u>
Air Quality / Greenhouse Gas				
5.6-1 - Violate any air quality standard or substantially contribute to an existing or projected air quality violation	S - Construction related air pollutant emissions would be potentially significant unless BAAQMD-recommended best management practices are incorporated into the project.	Greater impact - Construction activities would occur, with potential to generate dust and exhaust emissions from equipment. Without standard BMPs implemented by mitigation 5.6-1, the air quality impacts would be significant.	Greater impact - Under *Alternative 2* construction project could still occur that potentially emit significant levels of dust and construction equipment emissions. Without implementation of the BAAQMD standard construction BMPs such project could result in a significant impact.	Greater impact - Under *Alternative 3* construction projects could still occur that potentially emit significant levels of dust and construction equipment emissions. Without implementation of the BAAQMD standard construction BMPs such project could result in a significant

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
				impact.
5.6-2 - Expose Sensitive Receptors to Substantial Pollutant Concentrations	LTS - Smoke generated from prescribed burns has the potential to impact nearby sensitive receptors. Because the project would comply with BAAQMD Regulation 5, Open Burning this would be a less-than-significant impact.	Similar impact - Similar to the project, the *No Project Alternative* would not produce a substantial amount of emissions.	Similar impact - Similar to the project, *Alternative 2*would not produce a substantial amount of emissions.	Similar impact - Similar to the project, *Alternative 3* would not produce a substantial amount of emissions.
Noise				
5.7-1 - Noise Levels and Local Standards	LTS - Implementation of the VBMP would generate construction noise that would reach adjacent land use areas, particularly from vegetation management activities located where preserves border relatively quiet residential areas. Project BMP-General-8 *Control Noise* requires best available noise control techniques and use of sound baffling blankets, work hours would comply with Marin County Noise	Similar impact - Increase of noise levels could result without BMPs to control noise sources. However, the nature of work does not generate a substantial amount of noise and would be consistent with current standards.	Similar impact - Noise related impacts may be greater in severity than the proposed project; however, the nature of vegetation management activities would not generate significant levels of noise. Local noise standards are intended to reduce impacts near residential areas.	Similar impact - Noise impacts would be similar to those anticipated with implementation of the proposed project. ~~Less BMPs to control noise somewhat increase in noise emissions. However the MCOSD currently operates within construction hours of operation prescribed by the Marin County Noise Ordinance.~~

Impact	***Level of Impact for Draft VBMP***	***Level of Impact of Alternative 1 (No Project)***	***Level of Impact of Alternative 2 (Minimal Management)***	***Level of Impact of Alternative 3 (Risk Reduction)***
	Ordinance. With implementation of BMP-General-8 this impact would be less-than-significant.			
5.7-2 - Temporary Increases to Ambient Noise Levels	LTS - The work involved with project implementation activities would not generate substantial noise levels. Implementation of BMP-General-8 would help sustain existing quiet ambient noise levels.	Similar impact - Without project implemented BMPs to control noise sources at project site, the *No Project Alternative* could result with incremental increased noise from construction sources compared to the proposed project. However, current practices do not generate a substantial increases in ambient noise levels, and this would not change under the *No Project Alternative*.	Similar impact - Implementation of BMPs (such as BMP-General-8) would help sustain existing ambient noise levels.~~Noise generation may increase due to absence of BMP-General-8. However, currently noise generating activities do not result in a substantial amount of noise. There would be slight temporary increases to ambient noise levels.~~	~~Greater~~ Similar impact - Implementation of BMPs (such as BMP-General-8) would help sustain existing ambient noise levels ~~There may be an increase in noise levels due to the absence of BMP-General-8~~.
Visual Quality				
5.8-1- Scenic Resources	LTS - VBMP implementation would not substantially affect scenic resources and the visual quality of open space character would be maintained.	Similar impact - The *No Project Alternative* would result in a similar level of impact. There may be a decreased amount of work conducted.	Similar impact - Decreased degree of obstruction/impairment of views of scenic resources.	Similar impact - The scope of work for *Alternative 3* could be similar to the proposed project. No significant impacts to visual resource are anticipated to occur with the proposed project. Likewise,

Impact	*Level of Impact for Draft VBMP*	*Level of Impact of Alternative 1 (No Project)*	*Level of Impact of Alternative 2 (Minimal Management)*	*Level of Impact of Alternative 3 (Risk Reduction)*
				there would be no significant impacts with implementation of *Alternative 3*.
5.8-2 - Views from Highways - Regional Visual Quality	LTS - VBMP implementation projects would be small in scale and temporary. Views from highways, particularly documented scenic corridors, would not be significantly altered.	Similar impact - Similar level of impact to the proposed project.	Similar impact - *Alternative 2* would feature a reduced scope of work. Similar to the proposed project, any obstruction of views would be small scale and temporary.	Similar impact - Similar to the proposed project, any obstruction of views would be small scale and temporary.
Cultural Resource				
5.9-1 - Destruction of Cultural Resources	S - Ground disturbing activities related to vegetation maintenance and trail closure could potentially unearth unknown cultural resources.	Similar impact - With the *No Project Alternative* there would be a similar potential for ground disturbing activities related to vegetation maintenance and trail closure to potentially unearth unknown cultural resources and would result in a similar level of impact.	Similar impact - With *Alternative 2* there would be a similar potential for ground disturbing activities related to vegetation maintenance and trail closure to potentially unearth unknown cultural resources.	Similar impact - With *Alternative 3* there would be a similar potential for ground disturbing activities related to vegetation maintenance and trail closure to potentially unearth unknown cultural resources.

Response to Comment 14-7

Please see **Master Response 3 -- Alternatives to Herbicide Use** for a discussion on Integrated Pest Management (IPM). It would be inconsistent with sustainable open space IMP principals to categorically remove herbicides as a tool as, in some cases, herbicides may be the most effective and environmentally superior alternative available. The draft VBMP and Draft TPEIR references BMPs and mitigation described by a variety of sources, including MMWD. The MCOSD will utilize BMPs and mitigation measures to the extent practicable and feasible in a manner consistent with its IPM approach. These BMPs and mitigation measures are not derived solely from MMWD, nor does MCOSD rely on MMWD for their implementation. Because MMWD does not at this time use terrestrial herbicides, no coordination between MMWD and the MCOSD regarding herbicide is anticipated. Please refer to **Master Response 2 – Use of Glyphosate**, **Master Response 5 – Herbicide Use** and Response to Comment 4-85.

Response to Comment 14-8

The commentor states that the Draft TPEIR is inadequate to allow future site-specific action without further CEQA review. The VBMP is an adaptive management plan not a project development plan that is constructed at one time and has quantifiable direct and indirect potential impacts. As a long-term management plan the VBMP provides a framework for protecting and restoring natural habitat across 34 open space preserves encompassing over 14,600 acres, and contains BMPs and policies that are designed to avoid and minimize any potential adverse effects of implementation.

As fully discussed in **Master Response 12 - Deferral of Analysis and Mitigation** Chapter 5, Plan Implementation of the draft VBMP, includes a thorough discussion of how to further evaluate and refine details of individual projects contemplated under the VBMP. Furthermore, the commentor acknowledges that the Draft TPEIR (page 76) states that subsequent activities regulated by the VBMP must be examined in the light of this program EIR to determine whether an additional environmental document must be prepared according to *State CEQA Guidelines* Section 15168(c). The MCOSD's practice with respect to its *Road and Trail Management Plan*, a similar comprehensive plan with future projects that tier off the program EIR, is to prepare a written evaluation of specific implementation project requires additional environmental review. If no additional review is required, the MCOSD files a notice of determination as required by CEQA. Otherwise, the MCOSD will proceed with the additional review. It is further noted that a new Initial Study may be needed to be prepared leading to either an EIR or a Negative Declaration.

Response to Comment 14-9

See **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 14-10

See **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 14-11

See **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 14-12

See **Master Response 10 - Mitigation 5.1-1(a)** and **Master Response 12 - Deferral of Analysis and Mitigation**.

Response to Comment 14-13

Comment noted. Also, see **Master Response 7 - Hydrology and Water Quality**, which includes additional BMPs (most of which are recommended by the Cal-IPC Best Management Practices for Wildland Stewardship and additional mitigations that address timing of aquatic or near-aquatic herbicide applications and well as methods. The revisions to Mitigation Measure 5.2-1, including the Cal-IPC-based BMPs, are based on research in the technical literature on degradation rates for specific herbicides frequently used by MCOSD, and Hazard Quotients (HQs) determined for these herbicides and some of the surfactants used with them for different receptor organisms by both the TPEIR herbicide use consultants and the Pesticide Research Institute (author of Cal- IPC BMP manual).

Response to Comment 14-14

Exposure of aquatic organisms to fluazifop-P-butyl is highly unlikely because the Fusilade DX and Fusilade II labels do not allow for applications to water, to areas where surface water is present, to intertidal areas below the mean high water mark, or in areas where runoff into water bodies is expected. Fusilade DX and Fusilade II labels also restrict applications when rainfall is expected and recommend avoiding applications when rainfall is forecasted to occur within 48 hours. Use of herbicides in a manner inconsistent with its label is illegal and infractions are punishable by fines, prison or loss of licensure. Because of these significant penalties, the applicators who apply herbicides and pest control advisors (PCA) who prepare recommendations for the use of herbicides have a significant incentive to abide by the law and follow the label. Enforcement of pesticide use laws is significant. The California Department of Pesticide Regulation (DPR) has an entire branch devoted to enforcement and the County Agriculture Department has staff that regularly conduct random and unannounced field audits to check for compliance with pesticide use rules.

Prior to the control of vegetation, a PCA licensed by DPR evaluates the site and makes a determination as to the vegetation control method(s) that are most appropriate. If the selected control method involves the use of an herbicide, the PCA prepares a written recommendation that contains a detailed analysis of such factors as hazards and restrictions, runoff potential, sensitive receptors, restrictions on use, etc. Importantly, the PCA must certify that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted.

The PCA is, at a minimum, a four-year degreed professional that has qualified for and passed examinations that demonstrate expertise in vegetation management. To maintain currency, the PCA must complete no less than 40 hours of continuing education every two years. It is mandatory that laws and regulations are reviewed and this includes compliance with label directions. The expertise and credentials of the PCA allow him or her to exercise professional judgment in deciding which vegetation management techniques are most appropriate in a given circumstance. If runoff to nearby water bodies cannot be prevented, Fusilade DX and Fusilade II would not be recommended and other appropriate vegetation management tool(s) would be selected instead.

Also, please see **Master Response 7 - Hydrology and Water Quality**.

Response to Comment 14-15

The commentor is correct that where infestations are treated with herbicide and the treatment does not result in ground disturbance, temporary erosion control measures and eventual re-seeding of the area with native plants should be employed to minimize erosion and downstream sedimentation.

Impact 5.2-2 on page 172 of the Draft TPEIR is revised as follows:

> ***Impact 5.2-2 On-Site and Off-Site Erosion and Sedimentation***
> *Implementation of the VBMP may include machine~~-based~~, biological-, chemical-, and physical-based vegetation clearing, fuelbreak construction or clearing, or wetland restoration in tidal zones (e.g. Bothin Marsh). Fuelbreak construction could alter the local drainage and runoff regime by decreasing both the rate and volume of rainfall interception and the moisture storage provided by leaf litter atop the soil surface. The combined effect of these outcomes could be increased peak flows and runoff volumes, which could increase erosion and downstream sedimentation. Several BMPs for erosion and sediment control are included in the draft VBMP. While these measures would mitigate potential erosion and sedimentation impacts to some degree, they would be insufficient to reduce the impacts to a less-than-significant level. Thus, project implementation would result in a significant erosion and sedimentation impact.*

Mitigation Measure 5.2-2(b) is revised as follows:

> *Mitigation Measure 5.2-2(b)* In order to reduce impacts to erosion and sedimentation from activities related to the implementation of the VBMP the MCOSD shall adopt the following new best management practices:

BMP-Hydrology and Water Quality (new) *Temporary Erosion and Sediment Control*. Temporary sediment-control practices will be implemented when vegetation management projects result in grading or other significant ground disturbance, local denudation of vegetative cover or has the potential to discharge a significant amount of sediments or pollutants to surface water. Several of the listed temporary practices can also be used as post construction stabilization measures: Information and standard details for temporary erosion-control BMPs can be found in the California Stormwater BMP Handbook – Construction (CASQA 2009).

- Install temporary fencing around staging areas and along limits of construction when work areas are immediately adjacent to sensitive resources. This will limit the disturbance footprint and help protect resources, including native vegetation, wetlands, and streams, during grading operations.
- Install linear sediment barriers to slow and filter stormwater runoff from disturbed areas. Fiber or straw roll barriers can also be spaced along the contours of a disturbed area after construction to prevent concentrated flow and stabilize the area until there is sufficient vegetation coverage.

- Apply one or more of the following to restore or protect areas disturbed by excavation or grading operations:
    - tilling (minimum 6 inch depth) and seeding
    - hydromulch and tackifier
    - planting

  - straw or wood mulch
  - coir (jute) netting
  - biodegradable erosion-control blankets
  - plastic sheeting (only as an interim protection during storm events when construction site is still active)
- <u>Where denudation of vegetative cover and expected loss of local plant rooting follows an herbicide treatment, mulch, coir rolls or other appropriate erosion control treatment should be installed along the downslope perimeter of the treated area prior to the beginning of the rainy season (October 1). Once the soil within the rooting zone is determined to be free of inhibiting herbicide (or low enough so as not to affect new plant development), the denuded area should be scarified/tilled and seeded with native grasses and forbs and/or planted with desirable native plants that will protect the surface soils from erosion.</u>
- Cover soil and loose material stockpiles with weighted plastic sheeting when inactive or prior to storm events. Active and inactive material stockpiles will be encircled at all times with a linear sediment barrier. Manage sediment when diverting stream flow. When constructing trail or road stream crossings, a temporary clear-water diversion may be required. The following options will be considered for isolating the work area and protecting resources when diverting stream flow via gravity-fed flexible pipe or active pumping around the work area: sand or gravel bag coffer dam enclosed in plastic sheeting, water-filled dam (e.g., Aqua dam), sheet piling, and turbidity curtains.
- Manage sediment during dewatering operations. The following options will be considered for applying or containing and treating sediment-laden water produced during dewatering operations: sprinkler system to open area (as long as there is no visible surface runoff), temporary constructed sediment basin or trap, rented sedimentation tank (e.g., Baker Tank).

BMP-Hydrology and Water Quality (new) *Erosion Control Measures* Avoid the use of heavy equipment in areas with soils that are undisturbed, saturated, or subject to extensive compaction.

- If no feasible alternative is available and staging of heavy equipment, vehicles, or stockpiles is unavoidable, limit the disturbance footprint and flag or mark the allowable disturbance area in the field. Following the end of work, newly disturbed soils will be scarified to retard runoff and promote rapid revegetation.
- Immediately rehabilitate areas where project actions have disturbed soil. Require areas disturbed by equipment or vehicles to be rehabilitated as quickly as possible to prevent erosion, discourage the colonization of invasive plants, and address soil compaction. Techniques include decompacting and aerating soils, recontouring soils to natural topography, stabilizing soils via erosion-control materials, revegetating areas with native plants, and removing and monitoring invasive plants.
- Stumps may be cut or ground down to the ground level.

BMP-Hydrology and Water Quality (new) *Grading Windows* **-** Restrict grading activity to the dry months or during extended dry periods when associated erosion will be reduced to the maximum extent possible.

BMP-Hydrology and Water Quality (new) *Proper Disposal of Excess Materials* Avoid resource impacts when disposing of materials. Any excess material related to new construction, maintenance, or restoration (including soils, debris, trash, or other materials that need to be removed as part of management activities) will be disposed of at an appropriate site where materials could not impact sensitive resources.

BMP-Hydrology and Water Quality (new) *Sidecasting Construction Material*

Avoid sidecasting, or at a minimum contain and remove sidecast material when it has the potential to reach surface waters.

The following "rules of thumb" based on Fishnet 4C Guidelines (2007) will be used as guidance:

Slope gradient	Distance to watercourse	Sidecast rule
Any slope	Will likely enter watercourse	Not allowed
≤20%	≥150 feet	Allowed
≤50%	≥300 feet Allowed	Allowed
>50%	Long vegetated slope	Allowed
> 50%	Shorter, sparsely vegetated slope	Not allowed

Response to Comment 14-16

Fusilade DX, Fusilade II, Garlon 3A, Garlon 4 Ultra, Milestone, Transline, and Triclopyr 4E have ground water advisory warnings that indicate the active ingredients may leach through soil into ground water under certain conditions as a result of label use. Use of some these products may be restricted in ground water protection areas (GWPA), which is a one-square mile section of land that is considered sensitive to the movement of certain herbicides, potentially leading to herbicide detections in groundwater. [88] However, as no GWPAs are located in Marin County, these restrictions do not apply to MCOSD lands. [89]

Notwithstanding the above discussion on GWPAs and as discussed previously in Response to Comment 14-14, a state-licensed Pest Control Advisor (PCA) is involved in all herbicide applications. Potential impacts to groundwater resources are among the numerous factors considered by the PCA when preparing an herbicide recommendation. If in the event that the PCA is concerned that a potential impact to groundwater may occur, then the use of a pesticide in a circumstance conducive to groundwater impact would not be considered.

In addition to following the recommendations of a trained and credentialed PCA, all applications will be performed by, or under the supervision of a Qualified Applicator License (QAL) or Qualified Applicator Certificate (QAC) holder. QAL/QAC holders are individuals licensed by the State of California who must undergo 20 hours of training every two years to maintain currency and are trained in techniques to minimize impacts to groundwater from herbicide use.

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[88] California Department of Pesticide Regulation (CDPR). 2014. California Code of Regulations (Title 3. Food and Agriculture) Division 6. Pesticides and Pest Control Operations – Section 6800. Available: http://www.cdpr.ca.gov/docs/legbills/calcode/040101.htm (Accessed: May 6, 2016).

[89] *Ground Water Protection Area Lists*, California Department of Pesticide Regulation (CDPR). 2013, Available: http://www.cdpr.ca.gov/docs/emon/grndwtr/gwpa_lists.htm.

Response to Comment 14-17

The commentor raises concerns regarding the adequacy of the discussion of geology and soils impacts.

The VBMP is a scientific based comprehensive plan necessary to guide the MCOSD in its decision making for vegetation management projects. It is not a prescriptive plan that identifies specific projects or treatment methods. **Table 5.1** (*List of Potential Project to be Implemented*) in the draft VBMP identifies potential projects, which are not necessarily being proposed at this time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA review before the MCOSD can implement the activity. This will include an evaluation of geology and soils impacts based on the project-specific details.

Furthermore, it should be noted that the *Countywide Plan* contains policies and programs to protect people and property from risks associated with seismic activity and geologic conditions. Policy **EH-2.1** requires development to avoid or minimize potential hazards from earthquakes and unstable ground conditions. Program **EH 2.a** requires the preparation of geotechnical reports. Program **EH-2.f** continues to prohibit development in landslide areas and on landslide-prone deposits on steep slopes, except where the required geotechnical report indicates that appropriate mitigation measures can stabilize the site for construction.

In response to this comment Mitigation Measure 5.3-1 on page 190 of the Draft TPEIR is revised as follows:

Mitigation Measure 5.3-1 In order to reduce impacts related to landslide and debris flow hazards that would occur with implementation of the VBMP, the MCOSD shall adopt the following new best management practices:

BMP-Geologic Hazards-(new) Project Assessment and Construction Requirements in Geologically Hazardous Areas - Geologic hazards including landslides and debris flows in elevated areas shall be assessed by a geologist or geotechnical engineer and, if present shall be taken into account in the implementation of any ground disturbance treatments.

<u>No further action to address potential geologic hazards would be required if any of the following apply:</u>

1. The area subject to vegetation management activity is located in an area listed as "stable", "few landslides" or equivalent on the most currently available landslide mapping for the area.
2. The average steepness of the area is less than ten degrees (about 18 percent)
3. There is no visible evidence of landslide activity (e.g. scarps, crooked trees, landslide-generated debris piles) within the area, as documented by a field reconnaissance, and
4. There are no habitable structures within 100 feet of the toe of the slope downgradient of the recommended area.
5. The project does not involve denuding the project area of all vegetation.
6. If the above conditions do not exist a geotechnical report shall be prepared. The geotechnical report shall:
    a. Evaluate soil, slope, and other geologic hazard conditions

b. Commit to appropriate and comprehensive mitigation measures sufficient to reduce risks to acceptable levels, including post-construction site monitoring, if applicable, and

c. Address the impact of the project on adjacent lands, ad potential impacts of offsite conditions.

~~Geologic Hazard Areas for landsliding and unstable slope materials are those areas where known landslides and unstable materials are present or where the slope gradient, geology and subsurface water conditions make the terrain potentially unstable should non-engineered grading or slope alterations be performed without the appropriate geological/geotechnical analysis and mitigation recommendations.~~

BMP-Geologic Hazards-(new) Construction Performance Standards in Areas of Slides and Debris Flows - Ground disturbance areas of identified landslide and debris flow hazards shall be performed in a manner to avoid reactivation of landslides or decreasing slope stability.

Response to Comment 14-18

Asbestos is a fibrous mineral that is both naturally-occurring in ultramafic or serpentine rock (a rock type commonly found in California), and is used as a processed component of building materials. Because asbestos has been proven to cause serious adverse health effects, such as asbestosis and lung cancer, it is strictly regulated either based on its natural widespread occurrence, or in its use as a building material.

It is possible that serpentine rock outcroppings are present in the preserves, such as in the Ring Mountain Preserve as stated on page 182 of the Draft TPEIR.

The Bay Area Air Quality Management District (BAAQMD) enforces regulations of construction activities in soils that may contain naturally occurring asbestos. An Asbestos Airborne Toxic Control Measure (ATCM) for Construction, Grading, Quarrying and Surface Mining Operations was signed into State law in 2002. [90] The purpose of this regulation is to reduce public exposure to naturally occurring asbestos from construction and mining activities that emit dust that may contain asbestos. The Asbestos ATCM requires regulated operations engaged in road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas where naturally occurring asbestos is likely to be found, to employ the best available dust mitigation measures in order to reduce and control dust emissions.

For construction and grading projects that would disturb one acre or less, the regulation requires several specific actions to minimize emissions of dust such as vehicle speed limitations, application of water prior to and during the ground disturbance, keeping storage piles wet or covered, and track-out prevention and removal. Construction projects that will disturb more than one acre must prepare and obtain BAAQMD approval for an asbestos dust mitigation plan. The plan must specify how the operation will minimize emissions and must address specific emission sources. Regardless of the size of the disturbance, activities must not result in dust emissions that are visible crossing the property line.

[90] California Code of Regulations, Title 17, Section 93015.

The MCOSD would be required to consult with the BAAQMD's Enforcement Division prior to disturbance of soils that may contain asbestos. Adherence to this requirement ensures that asbestos-related impacts would be less-than-significant. The regulation is designed to employ the best available dust mitigation measures in order to reduce and control dust emissions. The regulation is designed to employ the best available dust mitigation measures in order to reduce and control dust emissions so that sensitive receptors are not exposed to unhealthy levels of this contaminant.

Response to Comment 14-19

Please see Response to Comments 19-20 through 19-25.

Response to Comment 14-20

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion on adjuvants, inert ingredients, and cumulative impacts of herbicide mixtures.

Response to Comment 14-21

See Response to Comments 14-14 and 14-16.

Response to Comment 14-22

Comment noted. Language on the Milestone and Transline labels pertain cautions associated with manure produced by animals grazing on vegetation treated with these herbicides. Although possible that animals grazing on treated plants may urinate or defecate on sensitive plants, this is not a likely occurrence due to the lack of spatial and temporal coincidence of these events. Since manure from grazing animals is not collected or composted and then distributed for use, potential impacts to sensitive or other plants from replanting into affected soil or compost is not expected. There would be no need to bring in goats in to graze down an area treated with Milestone or Transline as this vegetation would be adequately managed by the use of these herbicides. Hence, exposure to goats is not expected. The use of Milestone and Transline is prohibited in or near water and so risk to amphibians is not expected.

Response to Comment 14-23

Use of Envoy Plus (active ingredient clethodim) is prohibited under the following circumstances: directly to water, to areas where surface water is present, to intertidal areas below the mean high water mark, where runoff is likely to occur or where weather conditions favor drift from areas treated. Please see **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality and the BMPs and Mitigation Measures implemented to protect water quality. Because the combination of the aforementioned restrictions, BMPs and mitigations greatly reduces or eliminates exposure to fish and other aquatic organisms, acute and chronic risk to these receptors is similarly reduced or eliminated. Please refer to **Master Response 2 – Use of Glyphosate**, **Master Response 5 – Herbicide Use** and Response to Comment 4-85.

Response to Comment 14-24

Please see **Master Response 2 – Use of Glyphosate** for a discussion of glyphosate toxicity, human health and safety, environmental fate, effects on wildlife, and the WHO's conclusions regarding glyphosate. Refer to **Master Response 7 - Hydrology and Water Quality** for a discussion on impacts to water quality.

Response to Comment 14-25

Please see **Master Response 5 – Herbicide Use** for a discussion on postings, signage, and safety. Refer to **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate.

Response to Comment 14-26

The commentor is correct that the **Section 5.4 Hazards - Fire Hazards** of the draft TPEIR does not specifically address the potential increase in fire risk from the application of glyphosate. The VBMP is a comprehensive plan that lays out strategies to address the various vegetation management issues, including fuel management. This plan provides board strategic direction to the MCOSD and does not provide prescriptive or site-specific requirements. The Draft TPEIR evaluates the fire hazards associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time.

However, the draft VBMP includes **BMP-Fuel Management-1** which states that “Brush to be left onsite will be chipped or cut into sections that will stack flat to reduce the potential for ignition". The MCOSD will incorporate this BMP into future projects implemented under the VBMP. These future projects will also comply with the requirements of CEQA and the issue raised by the commentor will be considered during the subsequent phase of the environmental review.

Response to Comment 14-27

Please see Responses to Comments 14-28 through 14-33.

Response to Comment 14-28

Prescribed burns are infrequent and would not occur regularly enough to cause objectionable odors that are considered significant. Prior to controlled burns, the MCOSD conducts public outreach to notify nearby residences and the community of these events. There have been no confirmed complaints regarding odors from prescribed burns. [91] The threshold of significance for odors is whether or not a project would create objectionable odors affecting a substantial number of people (see page 279 of the Draft TPEIR). A measure of this impact would be the receipt of five (5) confirmed odor complaints per year, averaged over three years (see **Exhibit 5.6-2**, page 281 of the Draft TPEIR). Since there is no record of confirmed odor complaints from prescribed burns, a significant odor impact is not anticipated. Furthermore, as described on pages 286 through 287 of the Draft TPEIR, prescribed burns under the VBMP would be subject to comply with BAAQMD Regulation 5, Open Burning, which requires a smoke management plan. Reducing exposure of the public to smoke would also reduce the potential for odor impacts.

Response to Comment 14-29

A detailed analysis of GHG emissions was not conducted because the VBMP activities would vary from day to day, with many days not having any activities or emissions. There is a threshold of 1,100 metric tons per year for operational emissions that the project is expected to be well below. As noted on page 284 of the Draft TPEIR, “Activities that may lead to emissions

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[91] James Raives, MCOSD communications with Brian Sanford, Marin County Parks Superintendent, Southern Region, Chris Chamberlain, Marin County Parks Superintendent, Central Region, and Ari Golan, Marin County Parks Superintendent, Northern Region, April 2016.

of GHG under the VBMP would be similar or less than most construction activities. In addition, the activities are not anticipated to be extensive enough that they would even exceed the operational threshold of 1,100 metric tons on an annual basis over the period that the VBMP would be implemented." The BAAQMD CEQA Air Quality Guidelines provides a list of projects that would have operational GHG emissions below 1,100 metric tons per year. Examples in this list include 56 single-family residences, 53,000 square feet of office space, a 19,000-square foot retail center, etc. Operational emissions include the continuous emissions that are directly and indirectly associated with projects. These include vehicle travel, energy consumption, water use, and solid waste generation. Activities under the VBMP would certainly have lower emissions on an annual basis than the example projects listed by BAAQMD (see Table 3-1, page 3-2 of the BAAQMD CEQA Air Quality Guidelines, dated May 2011).[92]

Response to Comment 14-30

Because the project would not have significant GHG emissions, there are no mitigation measures identified in the TPEIR.

Response to Comment 14-31

The commentor mistakenly characterizes the State's Global Warming Solutions Act, Assembly Bill 32, as requiring "a reduction of GHG emissions by 15 to 20 percent from 1990 levels by year 2020." It is the Marin County Greenhouse Gas Reduction Plan that strives to achieve the 15 to 20 percent reduction, which is consistent with AB 32. AB 32 requires California to reduce its GHG emissions to 1990 levels by 2020. Many of the measures intended to meet the goal are contained in the AB 32 scoping plan, first approved in 2008 and updated in 2014. This is a statewide plan, requiring emission reductions from all sectors of the economy. A majority of the emissions reductions that will occur in Marin County will come through reductions from transportation (e.g., more fuel efficient cars and lower carbon content fuels), energy production (e.g., greater renewable sources and transition to lower carbon content fuels), and reductions from industry through "Cap and Trade" that began in 2013 and has a emissions cap that declines over time.

Response to Comment 14-32

Some chemical control methods may include application of herbicides that contain volatile compounds that could result in minor emissions of reactive organic gases (ROG) into the atmosphere. There are significance thresholds for emissions of ROG, which are 54 pounds per day, averaged daily. The sales of most products that have the potential to emit ROG are

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[92] In 2012 the Alameda County Superior Court issued a judgment finding that the Air District had failed to comply with CEQA when it adopted the Thresholds contained in their 2011 CEQA Air Quality Guidelines. The court did not determine whether the Thresholds were valid on the merits, but found that the adoption of the Thresholds was a project under CEQA. The court issued a writ of mandate ordering the District to set aside the Thresholds and cease dissemination of them until the Air District had complied with CEQA; therefore, the 2011 version of the guidelines is not available from BAAQMD. The Air District appealed the Court's decision. The Court of Appeal of the State of California, First Appellate District, reversed the trial court's decision. The Court of Appeal's decision was appealed to the California Supreme Court, which granted limited review regarding application of impacts of the existing environment upon a project. The Supreme Court ruled that CEQA generally does not apply to the impact of the existing environment upon a project. The Supreme Court remanded the case to the Court of Appeal for reconsideration in light of the Court's ruling. Due to litigation and a trial court's order which remains in place pending final resolution of the case, the Air District is no longer recommending that the Thresholds be used as a generally applicable measure of a project's significant air quality impacts. However, the outcome of this litigation will not affect the screening distance published by BAAQMD in their 2011 version of the CEQA Air Quality Guidelines.

regulated by the California Air Resources Board and BAAQMD (e.g., paints and solvents), thus limiting the emissions of ROG on a statewide or regional basis. ROG emissions can react in the atmosphere under certain conditions and lead to elevated ozone levels. Past and future application of chemical treatments would not have emissions that would have approach the threshold on any day, let alone on an average daily basis for the project. BAAQMD provides a list of screening sizes for projects that would have ROG emissions of 54 pounds per day (see Table 3-1, page 3-2 of the BAAQMD CEQA Air Quality Guidelines, dated May 2011). This list includes the painting, equipment operation and related vehicle activity associated with construction of 114 single family residences, a 277,000 square foot office building, a 67-acre City Park, and the list goes on… Activities conducted under the VBMP would be much less intensive and only emit very small amounts of ROG. For example, most applications described (i.e., over 95 percent) would be conducted using personnel with backpack-based applicators, hand-held wands, paint brushes, or sponges. In terms of particulate matter, the emissions would be even lower. The only significance quantified thresholds for particulate matter emissions apply to exhaust emissions. Fugitive particulate matter emissions are addressed and mitigated under Mitigation Measure 5.6-1, page 288 of the Draft TPEIR.

Response to Comment 14-33

MCOSD consists of 34 open space preserves, encompassing about 16,000 acres. There are a variety of land uses adjacent to these preserves and some include sensitive receptors. Most would be residences that would include the most sensitive receptors that could include any type of sensitive receptor (e.g., infants, elderly, disabled, etc.). Additionally, the draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the Draft TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity. The plan is not going to cause emissions of toxic air contaminants that would result in significant exposures to any sensitive receptors.

Response to Comment 14-34

Just because the vegetation management activities generate noise levels above ambient levels that would be noticeable to nearby users or wildlife does not mean the noise would cause a significant impact to the environment. As described in the Draft TPEIR, noise from vegetation management activities are considered to be temporary and are addressed in the same manner as temporary construction activities. While these activities might be ongoing throughout the MCOSD under the VBMP, they would be infrequent at any one place within the District. Currently, the District conducts maintenance and construction projects that have a similar noise impact.. The VBMP project's infrequent and intermittent noise would not be new sounds that would cause substantial temporary or periodic increases in the ambient noise environment.

Response to Comment 14-35

The commentor raises questions regarding the adequacy of the visual quality analysis, especially potential visual impacts of fuel breaks.

As discussed in the Draft TPEIR the *Countywide Plan* includes goals, policies, and programs to protect scenic resources by identifying important viewsheds, imposing design standards for public projects, and the regulating development on hillsides and ridgelines.

Goal **DES-4** and Policy **DES-4.1** would protect scenic quality and views of the natural environment, including ridgelines and upland greenbelts, hillsides, water, and trees, from adverse impacts related to development

Program **DES-4.b** would amend applicable codes and procedures to require appropriate placement, design, setbacks, and native landscaping of public facilities and encourage local agencies to adopt similar standards. These standards would apply to soundwalls, medians, retaining walls, power lines and water tanks, among other public facilities

Program **DES-4.c** would regulate mass and scale by ensuring that new structures respect environmental site constraints and the character of the surrounding neighborhood. New structures would also have to be compatible with ridge protection policies, minimize grading, and avoid tree-cutting, especially on wooded hillsides

Furthermore, a number of the BMPs in the draft VBMP (**BMP-General-1**, **BMP-General-3** and **BMP-General-5**) would help reduce visual impacts.

It should also be noted that within a fuel break not all of the vegetation is removed. Fuel breaks are areas where the vegetation cover and density is reduced in order to allow firefighting personnel quick access to construct a fire line (line of no vegetation) ahead of a fire's approach. In managing the fuel breaks within open space preserves, the MCOSD has focused on removing nonnative invasive broom species that grow densely in the understory of woodlands. Removing this dense buildup reduces fuel loads, removes ladder fuels, and reduces or eliminates an invasive species. The native tree canopy is left intact.

As noted in several other responses, the draft VBMP is a scientific based comprehensive plan necessary to guide the MCOSD in its decision making for vegetation management projects. It is not a prescriptive plan that identifies specific projects or treatment methods. Therefore, there is no list of proposed fuel breaks.

Table 5.1 (*List of Potential Project to be Implemented*) in the draft VBMP identifies potential projects, which are not necessarily being proposed at this time. Any new fuel breaks would have to be thoroughly evaluated for need and potential impacts and would have to undergo environmental review prior to any work.

The wide-area fuel break depicted in **Exhibit 5.4-13** is an example of a project to construct a fuel break that covers the southern portion of Old St. Hilary's open space preserve (about 1/5th of the preserve area) to illustrate the types and locations of fuel breaks. The area consists primarily of sloped grasslands with scattered oak stands and French broom. This exhibit does not show a specific project that the VBMP requires. However, it is understood development of a fuel break in this location would consist of the area being treated by hand cutting the French broom and acacia. The oak stands would remain.

The information above provides further support for the determination in *Impact 5.8-1* that impacts to scenic resources would be a less-than-significant impact.

Response to Comment 14-36

As stated on page 321of the Draft TPEIR, Marin County Code Section 22.20.040 *Archaeological and Historic Resources* requires that in the event that archaeological or historic resources are discovered during any construction, construction activities shall cease, and the Community Development Agency shall be notified so that the extent and location of discovered materials may be recorded by a qualified archaeologist, and disposition of artifacts may occur in compliance with State and Federal law.

Based on this comment and the information above Mitigation Measure 5.9-1 is revised as follows:

Mitigation Measure 5.9-1 In order to reduce impacts to cultural resources from activities related to the continued implementation of the VBMP the MCOSD shall adopt the following new best management practices.

BMP-Cultural Resources (new) _Historical and Archaeological Resource Mapping_ - Prior to vegetation management activities that involve ground disturbance MCOSD will physically evaluate the project area for likelihood of existence of Cultural Resources within the project site. The evaluation will include historically or archaeologically sensitive areas according to map 4-1 (Historical Resources) in the _Marin Countywide Plan_ and/or identified as culturally sensitive on other confidential maps on file with the county that list prehistoric or archeological sites. If the project area is identified as sensitive on any of these maps, the site will be field surveyed by a state-qualified archeologist or an archeological consultant recommended by the federated Indians of Graton Rancherias, who would make recommendation and develop proposals for any procedures deemed necessary.

BMP-Cultural Resources (new) _Construction Discovery Protocol_ - In the event cultural resources are uncovered during any earthwork ~~(that may occur from various activities explained elsewhere) all work in the vicinity of the find must be terminated until the discovery can be evaluated by an archaeologist. Depending on the extent and cultural composition of the materials, it may be advisable for subsequent excavations to be monitored by an archaeologist who would be ready to record, recover, and / or protect significant cultural materials from further damage. If discovered artifacts are considered prehistoric consultation with interested Native American groups is advised. The archaeologist may develop proposals for any procedures deemed appropriate to further investigate and / or mitigate adverse impacts to those resources.~~, pursuant to CEQA Guidelines 15064.5(f), “provisions for historical or unique archaeological resources accidentally discovered during construction” shall be instituted. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 100 feet of the resources shall be halted and MCOSD shall consult a qualified archaeologist/paleontologist to assess the significance of the find (per Public Resources Code Section 5024.1, Title 14 California Code of Regulations, Section 4852 and/or Public Resources Code 21083.2 in the event of a unique archaeological find). If any find is determined to be significant and will be adversely affected by the project, representatives of MCOSD and the qualified archaeologist/paleontologist would meet to determine the appropriate avoidance measures or other appropriate mitigation (per CEQA Guidelines 15064.5(b) and Public Resources Code 21083.2).

In the event that human skeletal remains are discovered anywhere in the preserves other than a dedicated cemetery, work in the vicinity of the discovery must be discontinued and the Marin County Coroner must be contacted. If skeletal remains are found to be prehistoric Native American (not modern), the Coroner will call the Native American Heritage Commission in Sacramento within 24 hours; they in turn will identify the person(s) believed to be the "Most Likely Descendant" of the deceased Native American. The Most Likely Descendant would be responsible for recommending the disposition and treatment of the remains. The Most Likely Descendant may make recommendations to MCOSD or the person responsible for the excavation work regarding the appropriate treatment and disposition of the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.

BMP-Cultural Resources (new) *Community Awareness -* The VBMP contains information about volunteer programs. Public outreach can include efforts to increase public awareness of local history and archeology, and the need to protect cultural resources. This may be accomplished by highlighting cultural resources along a road or trail with interpretive signs and information kiosks.

The commentor states that the TPEIR should disclose whether local Native American groups utilize MCOSD preserves for cultural activities and, if so, the extent to which the project will affect such uses. MCOSD staff recalls a group using the top of the Ring Mountain preserve about five years ago for cultural purposes. A ranger contacted them and asked them to apply for a permit in the future if they want to do it again. MCOSD staff have not heard back from anyone since that field contact by the ranger. There was a permit for a "horse blessing" at Horse Hill, but this appears to be a conducted by non-Native American using a Native American Ceremony.[93] Therefore, implementation of the VBMP would not affect Native American groups utilizing MCOSD preserves.

Response to Comment 14-37

The commentor raises a concern regarding the adequacy of the cumulative impact analysis (pages 353 through 372 of the Draft TPEIR. As noted on page 359 of the Draft TPEIR the cumulative analysis for this EIR is tiered from the *2007 Countywide Plan EIR* as discussed in Chapter 1.0 *Introduction* of the Draft TPEIR. Furthermore it should be noted that for the purposes of this TPEIR, implementation of the draft VBMP would have a significant cumulative effect if:

the cumulative effects of related projects (past, current, and probable future projects) are not significant and the incremental impact of implementation of the VBMP activities is substantial enough, when added to the cumulative effects of related projects, to result in a new cumulatively significant impact; or

the cumulative effects of related projects (past, current, and probable future projects) are already significant and the implementation of VBMP activities make a considerable contribution to the effect. In accordance with CEQA Section 21083.3(b)(2), "cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." The California Supreme Court has determined that in certain circumstances, miniscule contributions to a cumulative significant impact can be determined to be less than considerable (Save the Plastic Bay Coalition v. city of Manhattan Beach, S180720, July 14, 2011).

Based on the above guidance, the Draft TPEIR does provide reasons for its conclusions regarding cumulative impacts. The commentor cites the hydrology and water quality analysis and states that the section states that implementation of the draft VBMP would result in a significant impact by exceeding water quality standards and then concludes that the project will not made a cumulatively considerable contribution to the identified cumulative water and

[93] James Raives, MCOSD communication with Brian Sanford, Marin County Parks Superintendent, April 2016.

hydrology impacts. The Draft TPEIR does, however, provide the reasoning for this conclusion by stating:

> Some of the additional cumulative projects considered, particularly the Marin County Department of Agriculture, Weights and Measures' weed abatement program and MMWD's WPHIP program (Approach 2) could treat substantial areas for invasive plant control. MMWD's treatment zones would not affect the same reaches of creeks or tidal zones affected by MCOSD's treatment areas. In instances where the potentially affected waters join downstream, e.g. along Corte Madera Creek, sufficient channel distances and flow times would be present to allow for dissipation of any harmful concentrations before flow joined downstream

In regard to comments on mobilization into groundwater basins, refer to Response to Comment 14-16. The commentor claims that Marin County's waterbodies are designated as being excessively impaired by pesticides. However, no reference or support for this contention is provided.

The discussion of cumulative impacts on biological resources on pages 359 and 360 of the Draft TPEIR acknowledges the incremental reduction in the amount of and connectivity between existing natural communities and wildlife habitat. While mitigation measures may be available to address identified impacts on sensitive resources, such as wetlands and sensitive natural communities, the cumulative loss of undeveloped habitat and possible further fragmentation of the remaining natural areas would be cumulatively significant in Marin County. However, the draft VBMP includes comprehensive projects and BMPs to update and monitor baseline conditions on MCOSD lands, provide for avoidance and protection of sensitive natural resources as part of vegetation and other land management practices, and coordinate with regulatory agencies to ensure adequate mitigation is provided when potential impacts on sensitive natural resources cannot be avoided. With adoption of the mitigation measures which would revise a number of BMPs (as recommended in **Section 5.1 Biological Resources** of the Draft TPEIR), implementation of the VBMP would result in less-than-significant impacts on biological resources. With the MCOSD's acceptance of the revised BMPs, implementation of the VBMP would not make a cumulatively considerable contribution to the identified cumulative impact on biological resources, including the cumulative loss of undeveloped habitat and possible further fragmentation of the remaining natural areas.

Please see **Master Response 6 – Impact Evaluation** for additional discussion cumulative impacts related to herbicide use.

Response to Comment 14-38

Please see **Master Response 12 - Deferral of Analysis and Mitigation** for a discussion of the claim that the Draft TPEIR improperly defers the disclosure, analysis, and mitigation of potentially significant impacts.

Response to Comment 14-39

The commentor's opinion regarding the adequacy of the Draft TPEIR is noted. It is the opinion of the TPEIR preparers that the Final TPEIR has been prepared in compliance with CEQA. It will, however, be the responsibility of the MCOSD Board of Directors to certify the Final TPEIR. Certification of an EIR includes the finding that the document has been completed in compliance with CEQA and that it reflects the lead agency's independent judgment and analysis.

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Comment Letter 15

July 8, 2015

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Re: Vegetation and Biodiversity Management Plan and Draft Tiered Programmatic Environmental Impact Report

Dear Mr. Raives:

The Sierra Club wishes to thank you for the opportunity to comment on the Marin County Parks and Open Space District's ("MCPOSD") Vegetation and Biodiversity Management Plan, and the Plan's Draft Tiered Programmatic Environmental Impact Report ("DEIR").

In its current form, the Sierra Club feels that the DIER does not adequately support informed decision-making regarding the Plan, and therefore does not meet its requirements as a CEQA document for its intended purpose.

15-01 In particular, the Sierra Club is concerned that the DEIR fails to adequately describe the locations, amounts, effectiveness, and animal, human, and off-target flora toxicities of herbicide use within the Plan.

The Sierra Club has always promoted minimizing use of potentially harmful chemicals. We believe that there should be no public exposure to herbicide, herbicide residues, or potentially harmful herbicide byproducts.

15-02 Furthermore, new findings related to glyphosate toxicity, persistence, and efficacy, as well as links to human health effects, all raise concerns about glyphosate use; these new findings are not adequately evaluated in the current DEIR. Until additional research can demonstrate the safety and necessity of glyphosate it would be prudent to reserve use. The DEIR should provide, and currently fails to provide, adequate information to evaluate the potential risks and efficacy, or the specific locations and methods of use.

The Sierra Club shares many of the specific questions and concerns expressed in comment letters for this DEIR submitted by attorney Michael W. Graf and the Sustainable Tamalmonte organization, and wishes to incorporate those comments into this letter by reference.

Michele Barni

Michele Barni, Chair, Sierra Club Marin Group

RESPONSE TO COMMENT LETTER 15 - MICHELE BARNI, SIERRA CLUB MARIN GROUP, JULY 8, 2015

Response to Comment 15-1

The draft VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to improve the efficiency and effectiveness of its vegetation management activities, and it is not a prescriptive plan that identifies specific treatment methods or locations. Therefore, the Draft TPEIR evaluates herbicide use associated with strategies described in the draft VBMP and not the impacts from specific projects that the MCOSD would implement at a future time. As noted in **Chapter 3.0 Description of the Proposed Project** subsequent implementation activities will be subject to CEQA compliance before the MCOSD can implement the activity. The plan requires an IPM approach to vegetation management, which requires the use of the least environmentally damaging effective treatment method. Please see **Master Response 3 - Alternatives to Herbicide Use** for a discussion on Integrated Pest Management (IPM). Because the MCOSD uses an IPM approach, the Draft TPEIR did not intend and cannot describe the locations and amounts of herbicide used. The use of herbicide is highly variable and because of the MCOSD's IPM program, herbicide applications are not scheduled. Rather, depending on site-specific needs, herbicide applications are only made on an "as-needed" basis. The effectiveness of herbicides is variable depending on the herbicide, method of application, plant and environmental conditions. Specific details on herbicide effectiveness are presented in product labels included in the Technical Appendix. Details on the toxicity of herbicides is presented in Appendix E of the Draft TPEIR.

Response to Comment 15-2

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, human and ecological safety, and environmental fate.

Comment Letter 16

Marin Chapter
California Native Plant Society

California Native Plant Society

James Raives
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JRaives@marincounty.org

Re: Draft Tiered Program Environmental Impact Report (DTPEIR) for the Vegetation and Biodiversity Management Plan (VBMP)

Dear Mr. Raives:

The following comments are submitted on behalf of the Marin Chapter of the California Native Plant Society (Marin CNPS) regarding the Draft Tiered Program Environmental Impact Report for the District's Vegetation Management and Biodiversity Plan (VMBP). The California Native Plant Society is an organization of nearly 10,000 members statewide dedicated to conserving native plants and their natural habitats and to increasing the understanding, appreciation, and horticultural use of native plants. Marin CNPS has 350 members.

Marin CNPS's August 16, 2013 comment letter on the Administrative Draft of the VMBP is incorporated by reference herein and separately attached. At that time, we commended the Plan for its balanced, science-based approach that comprehensively addresses several vegetation-related issues at the same time: protection of natural resources, control of invasive species, fire safety, climate change, and forest health.

CNPS now finds that the DTPEIR presents a thorough analysis of the activities planned in the VBMP, potential impacts on the natural resources and public safety and such mitigating measures as may be necessary. In particular, we support the District's commitment to the restoration of native vegetation and natural habitats on Open Space lands, removal of invasive plants, adherence to the principles of Integrated Pest Management, and its new approach to fuel-breaks.

Further, we agree with the DTPEIR's conclusion that the VBMP, as modified by appropriate mitigating measures, is the environmentally superior alternative.

We add the following specific concerns:

- *Biological resources and special status plants*

16-01 First, CNPS appreciates that in a general planning document such as this one, impacts and mitigating measures pertaining to specific management actions can only be recognized and formulated at a later date and on a case-by-case basis. Thus, we accept the need to defer the development of specific plans to Treatment Programs to be prepared wherever management activities are needed within the 100-foot buffer zones around special status plants, sensitive plant communities and wetlands. We believe, however, that final TPEIR should expressly require approval of such plans by supervisory-level District staff or by the District board of directors.

16-02 Second, Marin CNPS suggests that the final TPEIR include mandatory sanitary practices for equipment and vehicles of both the County and its contractors so as to prevent further introduction of invasive exotic plants.

- *Hazards of herbicide use to control invasive plants*

CNPS strongly supports Integrated Pest Management (IPM) as the proper approach to the use of herbicide for weed control. CNPS official policy statements on these issues can be found at http://www.cnps.org/cnps/conservation/pdf/IWM_policy.pdf and http://cnps.org/cnps/conservation/pdf/Herbicide_policy.pdf).

IPM, as defined in our policy statements and by the California Invasive Plant Council (Cal-IPC), calls for conservative, targeted use of herbicides for specific restoration projects, along with mechanical, chemical, and biological methods, based on effectiveness, efficiency, practicality, ecological impact, and safety.

We further support the District's application of IPM principles for the control of invasive plants on Open Space lands. As a general matter, staff will carefully consider whether the invasive species in question can be eradicated without herbicide, taking into account the scale of the project, the species biology and the negative impact or ineffectiveness of alternative methods. Staff will also consult the Vegetation and Biodiversity Management Plan and the final TPEIR to evaluate the impacts of the proposed practices. Many County staff have years of field experience on top of PhDs or master's degrees in biology or pesticide applicator qualifications.

16-03 Nevertheless, we find the analysis of herbicide impacts on non-target native plants to be inadequate.   Impact 5.5-3 of the DTPEIR (page 270) assumes that non-target vegetation will be non-native grasses and weeds on the one hand or sensitive or special status species on the other hand. Since sensitive and listed species and plant communities are to have 100-foot buffer zones, the Report proposes that specific Treatment Plans be drafted to protect such resources during targeted use of herbicide within buffer zones.

16-03 (cont.)

These measures are reasonable to protect sensitive species and plant communities from accidental exposure to herbicide although again, we urge the District to require that such Treatment Programs be approved by supervisory level staff or the District board of directors.

But we must also point out that the DTPEIR fails to recognize impacts to un-buffered, common native vegetation that may be exposed to herbicide drift or drip during foliar and rope-wick applications. Appendix E, while it rates the severity of impacts of specific herbicide products and application methods on fish, mammals, birds, humans and insects, also does not discuss such presumably-severe impacts. It is thus essential that the final TPEIR analyze impacts of foliar and rope-wick herbicide application on common native plants and propose appropriate mitigation measures.

Finally, options for reducing impacts on non-target native vegetation should include shielding and tarping in addition to spot-spraying.

- *Fire hazards*
  As stated in our August 16, 2013 letter, Marin CNPS supports the VMBP's de-emphasis on primary fuel-breaks in the interiors of preserves in favor of the redirection of available resources to the preserve perimeter and the Wildland-Urban Interface. This will directly protect native vegetation and help reduce the spread of broom and other aggressive non-native invasive plants in these areas where habitat value is higher.
  As we observed on page 5, "[T]he most effective strategy for reducing catastrophic losses from wildfires is to minimize the management effort spent on the bulk of the chaparral landscape and focus on strategic locations. The worst fires predictably follow landscape features, and these patterns can be used to select buffer zones at the urban-wildland interface for more intensive fuel management."

  To implement these concepts, the VMBP directs the District to consult with County fire agencies to evaluate all fuel-breaks, existing and planned, for both effectiveness and environmental impact according to a Fuel-break Decision-Making Making Matrix. Fuel-breaks that are deemed critical for wildfire control and/or firefighter safety will be maintained and those that do not adequately serve the intended purpose will be converted into passages for egress/ingress or removed and restored to native vegetation. Wherever possible, fuel-breaks will be downgraded or eliminated and any new fire-breaks must be allocated funds for maintenance, erosion control and treatment of invasions. This careful case-by-case examination will ensure that fire safety needs are met while vegetation, natural ecosystems and habitat are protected to the maximum extent.

16-04 While Marin CNPS approves of this approach overall, it is concerned that Impact 5.4-1 (Page 221-37) fails to address the impacts on native vegetation that would result if County staff-- under pressure from fire agencies or for some other reason-- failed to implement the VMBP's approach as described above. Such impacts would include further invasions of exotic plants and abandonment of critical restoration efforts.

The DTPEIR's failure to perform such analysis stands in marked contrast to Impact 5.4-2's thorough discussion of impacts that would occur if the District failed to carry out measures for protecting structures and humans from fire danger. (Page 236). The DTPEIR should therefore address uncertainty inherent in the application of the Fuel-break Decision-Making Matrix by identifying the associated risks to native vegetation and appropriate mitigating measures.

Thank you for the opportunity to comment.

Carolyn K. Longstreth

Carolyn Longstreth, Conservation Committee, Marin Chapter

California Native Plant Society

Attachment to Letter 16

California Native Plant Society
Marin Chapter

August 16, 2013

Via Email to LDahl@marincounty.org

Linda Dahl, Director
Marin County Parks and Open Space District (”the District”)
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903

Re: *Administrative Draft Vegetation Management & Biodiversity Plan (ADVMBP)*

Dear Ms. Dahl:

The following comments are submitted on behalf of the Marin Chapter of the California Native Plant Society (Marin CNPS) regarding the administrative draft of the Vegetation Management and Biodiversity Plan (ADVMBP).

The California Native Plant Society is an organization of nearly 10,000 members statewide dedicated to conserving native plants and their natural habitats and to increasing the understanding, appreciation, and horticultural use of native plants. Marin CNPS has 350 members.

Introduction. Marin CNPS commends the ADVMBP for its balanced, science-based approach that comprehensively addresses several vegetation-related issues at the same time: protection of natural resources, control of invasive species, fire safety, climate change, and forest health. The chapter supports the ADVMBP's overall approach and urges the District to proceed to a formal review thereof under the California Environmental Quality Act (CEQA).

While Marin CNPS plans to submit input during the CEQA process, it takes this opportunity to comment on the issue of fuel-breaks.

Our Chapter fully supports the District's effort to integrate the fire safety aspects of the ADVMBP with the goals of its own 2008 strategic plan. Goal #1 is to "protect, restore, and preserve the natural systems of the lands held in trust for current and future generations." Moreover, CNPS concurs with the ADVMBP's observation that "resources in good condition have a high level of resilience to ecological pressures, such as climate changes, droughts, diseases, or invasive plants, and therefore require less active management than resources that are degraded or otherwise in need of active management." ADVMBP, p. 3-5.

CNPS also supports the ADVMBP's call for a reevaluation of fuel management techniques in light of current science and the experience of other Bay Area land management agencies. Accordingly, we agree with the Plan's recommendation to shift the focus of vegetation management actions away from the ridge-tops and preserve interiors and toward the perimeters and areas adjacent to the wildland-urban interface (WUI). ADVMBP, pp. 3-27 to 38, 4-61 to 72.

Fuel-breaks Sited on Ridgetops and in Preserve Interiors Are Less Effective at Stopping Fires Than Previously Believed and Have Detrimental Impacts on Native Vegetation. A growing consensus among fire ecologists holds that fuel-breaks on ridge-tops or in interior of preserves are more useful for firefighting logistics than they are in actually stopping the spread of wildfire, particularly in chaparral.[1]

[1] Syphard et al, Comparing the role of fuel breaks across southern California national forests, Forest Ecology and Management, Vol. 261 Issue 11 (2011), pp. 2038-48 (" In general, fuel breaks played an important role in controlling large fires only when they facilitated fire management, primarily by providing access for firefighting activities"); Keith J. Lombardo, Thomas W. Swetnam, Christopher H.

Indeed, there is additional evidence that under some circumstances, fuel-breaks are counterproductive in terms of fire prevention because they encourage invasion by flammable exotic grasses and shrubs. Studies confirm that construction of fuel-breaks in chaparral often leads to an undesirable vicious cycle in which fuel-break construction disturbs natural vegetation, thereby providing the opportunity for invasions by alien species. Highly flammable exotic annual grasses and woody shrubs fill exposed areas and gaps between native shrubs, resulting in fires that occur earlier in the season and at shorter intervals. Because many of the native woody plants depend on seed generation to reproduce (as opposed to root sprouting), up to 20 years is needed for the plants to mature sufficiently to set seed. Consequently, more frequent and more serious fires are detrimental to the long-term viability of these shrubs. Over time, native chaparral declines, resulting in a complete conversion of the site to non-native vegetation. [2]

Baisan, Mark I. Borchert, Using Bigcone Douglas-fir Fire Scars and Tree Rings to Reconstruct Interior Chaparral Fire History, Fire Ecology Vol. 5, No. 3 (2009)("costs may be better spent on wildland-urban interface management and updating zoning regulations to reflect the current scientific consensus. In the context of low fuel moisture levels and strong Santa Ana wind events, irregular spatial arrangement of fuels has been shown to be ineffective in controlling fire spread in chaparral landscapes"); J.E. Keeley, J. Franklin and C.M. D'Antonio, Fire and invasive plants on California landscapes, in *The Landscape Ecology of Fire*, ed. D. McKenzie, C. Miller and D.A. Falk (2011)("Although many fuel breaks have contributed to fire operations, doubtlessly many have not, and there is a need for careful evaluation of the benefits relative to the financial and resource costs of these activities"); Keeley et al., Ecological Foundations for Fire Management in North American Forest and Shrubland Ecosystems (USDA General Technical Report PNW-GTR-779 (2009) ("Forests with less surface fuels after treatment assist fire suppression by providing safer defensible space for firefighters, even if the treated areas do not completely stop fire spread").

[2] Keeley et al., Ecological Foundations for Fire Management in North American Forest and Shrubland Ecosystems (USDA General Technical Report PNW-GTR-779 (2009)(" The major resource threat posed by the current high-frequency fire regime is loss of native vegetation. Chaparral recovery requires two or more

This pattern has been shown to occur following invasions by several exotic species that are common in Marin-- wild oats, ripgut brome, foxtail barley, veldt grass, Scotch and French broom. Lambert et al., Invasive Species and Fire in California Ecosystems, *Fremontia* Vol. 38 No. 2-3 (2010). The several species of broom, especially common invaders in Marin open space preserves, are highly flammable and readily set off this downward trajectory. J.W. LeBlanc, Getting a Handle on Broom: Scotch, French, Spanish and Portuguese Brooms in California, U.C., Agricultural and Natural Resources, Publ. 8049.

Based upon these findings, we are hopeful that the District will implement the recommendation to deemphasize primary fuel-breaks in the interiors of preserves. This will directly protect native vegetation and help “reduce the spread of broom and other aggressive non-native invasive plants in these areas where habitat value is higher.” ADVMBP, p. 4-66-67.

Fire Safety Increases When Fuel-breaks are Sited Near the Perimeter of Preserves and Homes are Fire-proof and Surrounded by Defensible Space.

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decades of fire-free conditions, and more frequent fires have a destabilizing effect. High fire frequency displaces native shrubs with alien annual grasses and forbs, leading to increased flammability, decreased slope stability, and loss of biodiversity”); Lambert et al., Invasive Species and Fire in CA Ecosystems, Fremontia Vol. 38 No. 2-3(2010); S.L. Drill, Sustainable and Fire-Safe Landcapes: Achieving Wildfire Resistance and Environmental Health in the Wildland-Urban Interface, Fremontia, Vol. 38, No. 2-3 (2010), p. 37; J.E. Keeley, J. Franklin and C.M. D’Antonio, Fire and invasive plants on CA landscapes, in *The Landscape Ecology of Fire*, ed. D. McKenzie, C. Miller and D.A. Falk (alien grasses and forbs alter fire regimes, increasing fire frequency in younger shrubland stands); K.E. Merriam et al., Fuel breaks affect nonnative species abundance in Californian plant communities, U.S.F.S. (2006)(nonnative plant abundance was over 200% higher on fuel breaks than in adjacent wildland areas. Relative nonnative cover was greater on fuel breaks constructed by bulldozers (28%) than on fuel breaks constructed by other methods (7%)); M.L. Brooks et al., Effects of invasive alien plants on fire regimes, BioScience, Vol. 54 No. 7, p.677-88 (2004).

The ADVMBP proposes that, "in interior areas of preserves, where [the District] will focus primarily on the protection of high-value resources, ingress/egress fuel modification will be the preferred treatment for any fuel modification zones that cannot be relocated to the periphery of the preserve." ADVMBP, pp. 4-66-67.

The scientific literature strongly supports the concept of shifting vegetation treatment and other measures closer to the preserve perimeter and the WUI itself. "[T]he most effective strategy for reducing catastrophic losses from wildfires is to minimize the management effort spent on the bulk of the chaparral landscape and focus on strategic locations. The worst fires predictably follow landscape features, and these patterns can be used to select buffer zones at the urban-wildland interface for more intensive fuel management" Jon E. Keeley, C. J. Fotheringham, Marco Morais, Reexamining Fire Suppression Impacts on Brushland Fire Regimes, Science, Vol. 284; 11 June (1999), p. 1829.[3]

Even as scientific support erodes for the use of ridge-top fuel-breaks for fire prevention purposes, studies are showing that the most effective practice in preventing loss of homes to fire is the creation of defensible space around structures. As succinctly stated by Jack Cohen, of the U.S. Forest Service Fire Sciences Laboratory, "By definition, wildland-urban interface fire disasters depend on homes igniting during wildfires. *If homes do not ignite and burn during*

[3] See also J.E. Keeley et al., Ecological Foundations for Fire Management in North American Forest and Shrubland Ecosystems (USDA General Technical Report PNW-GTR-779 (2009 ("Other systems, such as California chaparral, where the balance of ignitions and suppression has led to minimal alteration of fuel loads and fire regimes, may not be good candidates for fuel treatments. In ecosystems where grazing and invasive grasses have altered fire regimes, it may be more appropriate to focus restoration efforts on reducing invasive species.")

wildfires then the WUI fire problem largely does not exist [emphasis added]." The Wildland-Urban Interface Fire Problem, Forest History Today (2008).[4]

In addition to the creation of a defensible space, modifications to home design and maintenance are effective measures to prevent the loss of homes to wildfire. Cohen states that "a home's ignition potential during extreme wildfires is determined by the characteristics of its exterior materials, design and associated flammable debris related to surrounding burning objects within 100 feet (30 meters) and firebrands (lofted embers)." The Wildland- Urban Interface Fire Problem, Fremontia Vol. 38- 2-3 (2010), p.19. Appropriate adjustments prevent ignition by keeping embers out of vents and dry debris from collecting in gutters and on rooftops.

The ADVMBP is Consistent with the County Strategic Fire Plan. The Strategic Fire Plan for Marin County (2011)("SFPMC") supports the key aspects of the ADVMBP. First, it includes among "assets at risk" not only structures and residential properties but also "watersheds and water, wildlife, habitat, special status plants and animals, scenic cultural and historic areas, recreation, rangeland, structures, and air quality." SFPMC, p.10. Second, the SFPMC recognizes that loss of homes to wildfire is attributable not to wildland fuels so much as to the home's tendency to ignite because of poor design, landscaping and maintenance. SFPMC, p.14. The plan cites a 1993 study which found, after a Santa Barbara wildfire, "an 86% survival rate for homes with non-combustible roofs and 30 feet of defensible space." SFPMC, p.14.

[4] Cohen, The Wildland-Urban Interface Fire Problem, Fremontia Vol. 38- 2-3 (2010), p.16; Moritz et al., Testing a basic assumption of shrubland fire management: how important is fuel age? *Ecological Society of America*, 2004 ("Minimizing losses of life and property will ultimately require a science-based approach that integrates fireproofing of structures, intelligent landscaping, better evacuation preparation, and land use planning that constrains rapidly expanding urban–wildland interfaces").

Conclusions. For all of these reasons, CNPS favors the fuel-break policies proposed in the ADVMBP. We believe that the recommended practices will better preserve our unique native vegetation in the interior of open space preserves by (1) reducing disturbance or removal of native chaparral and forests , (2) leaving intact areas undisturbed and (3) providing more resources for the elimination of invasive plants. At the same time, implementing the ADVMBP will afford greater fire safety in the WUI by shifting resources toward creating and maintaining defensible space around homes and at the edge of preserves.

Even as we support the approach taken by the ADVMBP, CNPS also applauds the Plan's flexible approach toward existing fuel-breaks. Under the ADVMBP, the District will consult with County fire agencies to score each existing and planned fuel-break according to a decision-making matrix for both effectiveness in terms of fire prevention and environmental impact. ADVMBP, Table 4-9. Fuel-breaks that are deemed critical for wildfire control and/or firefighter safety will be maintained and those that do not adequately serve the intended purpose will be converted into passages for egress/ingress or removed and restored to native vegetation. Wherever possible, fuel-breaks will be downgraded or eliminated and any new firebreaks must be allocated funds for maintenance, erosion control(,) and treatment of invasions.

This careful case-by-case examination will ensure that fire safety needs are met while vegetation, natural ecosystems and habitat are protected to the maximum extent.

In sum, CNPS finds the recommendations of the ADVMBP regarding fuel management to be common-sense, environmentally-sound measures that will enhance the County's stewardship of its open space lands while also improving our readiness for wildfire in the WUI. One final note, however: even on the perimeter of reserves, defensible spaces and ingress/egress passages need to be carefully planned and maintained, keeping in mind the risk of a vicious downward cycle of alien invasions, more frequent fires, and loss of plant diversity.

Thank you for the opportunity to comment.

Carolyn Longstreth, Conservation Committee, Marin Chapter
Eva Buxton, Conservation Committee, Marin Chapter
California Native Plant Society

RESPONSE TO COMMENT LETTER 16 - CAROLYN LONGSTRETH, MARIN CHAPTER, CALIFORNIA NATIVE PLANT SOCIETY, UNDATED

Response to Comment 16-1

The commentor understands and appreciates the nature of the VBMP as a management plan where potential impacts can generally only be qualitatively assessed, and the importance of having a framework to further assess and address project-specific impacts as part of the treatment program called for as revisions to **BMP-Sensitive Natural Resource-1** in Mitigation Measure 5-1.1(a). The commentor believes the Final TPEIR should require that the recommended treatment programs called for in Mitigation Measure 5.1-1(a) be approved by "supervisory-level District staff or by the District board of directors". Decisions such as this over the adequacy of a treatment program are currently made by management level personnel with MCOSD, including Chief of Resources, Director, Assistant Director, and Superintendent. The annual monitoring report required under the recommended revisions to **BMP-Sensitive Natural Resoruce-1** would allow for appropriate monitoring of management activities necessary to determine the effects on sensitive natural resources and allow for adaptive management practices, where necessary, to further minimize any adverse effects and improve successes in implementation. Requiring that all treatment programs be approved by "supervisory-level District staff' or by the MCOSD Board is not warranted to verify the effects on sensitive natural resources. No revisions to the Draft TPEIR are recommended in response to the comment.

Response to Comment 16-2

The concerns of the commentor over the importance of proper sanitation procedures for equipment and vehicles are noted. The VBMP contains numerous BMPs related to preventing the spread of invasive species through inadvertent contamination. **BMP-General-7** includes appropriate restrictions during construction to minimize the spread of invasive species, and **BMP-General-9-Conduct Worker Training** requires a worker training program for all field personnel prior to initiating the project, including an explanation of measures being taken to avoid or reduce adverse impacts. **BMP-Fuel Management-8** calls for reducing the potential for spread of invasive plants during fuel management activities through compliance with a number of practices. And **BMP-Fuel Management-9** calls for conformance with federal and State regulations governing Sudden Oak Death. Collectively, these BMPs would provide for the proper sanitary procedures requested by the commentor. No revisions are necessary.

Response to Comment 16-3

The commentor raises a question regarding impacts to non-target native plants. With implementation of the VBMP, the MCOSD is not going to be treating large areas of "non-target native vegetation". Where chemical application is used as a treatment method, the focus would be on stands of invasive species or individual target plants, not intact native vegetation. Some adjacent common native vegetation could be affected by herbicide application of target invasive species, but this would not be significant.

In response to the commentor's suggestion to include shielding and tarping in addition to spot-spraying as a way of reducing impact on non-target native vegetation, tarping/shielding is infeasible for large scale applications and is not recommended,

Response to Comment 16-4

Section 5.4 Hazards - Fire Hazards of draft TPEIR only analyzes the potential impacts of implementation of the VBMP to fire risk and hazards (to humans and structures). The purpose of the fire hazards section of the draft TPEIR is to analyze whether implementation of the VBMP would impair or interfere with emergency or evacuation plans, expose people or structures to increased risks from wildland fires, result in the need for new fire protection facilities, or result in inadequate emergency access (see significance criteria on page 221 of the Draft TPEIR) and thus have a significant impact. Consistent with CEQA, the TPEIR evaluates the impacts of the plan as proposed and does not analyze the potential impacts and mitigation measures if the plan was not implemented as described. Whereas, in evaluating *Impact 5.4-2*, the TPEIR identifies ambiguities in the draft VBMP that may result in a significant impact and requires mitigation to address the ambiguities.

The commentor is raising concerns about the biological impacts from the implementation of the fuel reduction measures described in the draft VBMP. The TPEIR evaluates the impact of the VBMP on biological resources in **Section 5.1**. The biological evaluation in the Draft TPEIR recognize that the creation and maintenance of fuel breaks could affect special status species, sensitive communities, wetlands, and wildlife. **Section 5.1** concludes that with implementation of the BMPs detailed in the draft VBMP along with the mitigation measures required by the TPEIR, impacts to these biological resources would be reduced to a less-than-significant level.

The commentor expressed concerns over the possibility that MCOSD staff would succumb to pressure from fire agencies and not implement the approach to de-emphasize primary fuel breaks through the interior of preserves in favor of redirecting available resources to the Wildland-Urban interface at the perimeter preserve. The commentor believes this would result in additional impacts on native vegetation, further invasions of exotic plants, and abandonment of critical restoration efforts. The MCOSD is committed to implementing the VBMP, including the program to redirect available resources to the Wildland-Urban interface, and there is no basis to assume it will not be successfully implemented. CEQA does not require an EIR to evaluate possible environmental impacts if a program or project were to fail, although it is important to disclose programs that appear infeasible or unsuccessful, which does not seem to be the case with the fire hazard program in question. Additionally, under CEQA the MCOSD must examine an implementation project resulting from a program EIR to determine whether additional environmental document must be prepared. If the subsequent project has effects not examined in the program EIR, CEQA requires the lead agency prepare a new initial study leading to either an EIR or negative declaration.

Comment Letter 17

Raives, James

From: Corinne Swall <corinne.swall@comcast.net>
Sent: Saturday, July 04, 2015 3:36 PM
To: Raives, James
Subject: Round Up

17-01

Sloats Nursery does not sell Round Up any more. France has banned Round Up. Why is anyone in Marin still even talking about it. The results of the last election to the Board of MMWD certainly indicated the public's vote on this issue. Corinne White

RESPONSE TO COMMENT LETTER 17 - CORINNE SWALL, JULY 4, 2016

Response to Comment 17-1

The commentor stated her concern with the use of Round Up (glyphosate). This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. The VBMP is a comprehensive plan providing the MCOSD with strategies for effectively and efficiently implementing a vegetation management program. It is not a plan that prescribes specific treatment measures. The plan requires the District to use an IPM approach that requires the use of the least harmful most effect treatment method. Herbicides, including glyphosate, are among the treatment methods considered under an IPM approach. For a discussion on glyphosate use and safety, please see **Master Response 2 – Use of Glyphosate**. The Marin County IPM Ordinance maintains a list of pesticides that are allowed for use. Glyphosate is among the list of herbicides on the approved list, and in the case of the MCOSD, it is used to maintain "critical habitats to protect endangered plants and native species" and for fuel reduction to protect people and homes from fire.

Comment Letter 18

July 4th, 2015

To: Marin County Open Space District (MCOSD)
Attention: James Raives
Electronically Delivered: JRaives@marincounty.org

Subject: On Record w/Written Comment via Support Documentation in regards to the Draft Tiered Program Environmental Impact Report (Draft TPEIR)

The bottom line is that we, the citizens within Marin County, whom elected this governing body, to not poison in any conscious or unconscious means the land, water, or air that is ingested by your citizens. Period.

There are safer methods, if even necessary in some currently defined projects, to control weeds, such as mechanical mowing, hand removal, goat grazing, planting beneficial plants to compete with and replace the weeds.

Currently on Bellam Blvd and King Mt., along with the video from Berkeley Labs, all are successfully using goats.

https://www.facebook.com/BerkeleyLab/videos/10153757410327923/

Simple five (5) minute lesson.
http://gu.com/p/49ecv/sfb

Marin citizens' beliefs align with this Environmental Law Conference…
https://www.youtube.com/watch?v=AT4Zczx_bik&feature=youtu.be

… and proof!
http://healthimpactnews.com/2014/glyphosate-herbicide-causes-antibiotic-resistant-bacteria-kidney-disease-and-infertility/

http://healthimpactnews.com/2015/glyphosate-causes-cancer-epa-trade-secret-sealed-files-reveal-cancer-link-known-back-in-the-1970s/

https://www.youtube.com/watch?v=yQRuOj96CRs

Others in CA saying NO.
https://www.facebook.com/download/1605317569738967/City%20of%20Richmond%20pesticide%20ban.pdf

http://althealthworks.com/5440/the-city-of-san-diego-is-suing-monsanto-for-poisoning-its-marine-life-and-polluting-its-bay/

Everyone is forging the way and so will we!
http://ecowatch.com/2015/06/26/pope-francis-pesticides-gmos/

http://www.huffingtonpost.com/maggie-sergio/god-will-give-me-justice_b_7648746.html

http://www.arc2020.eu/2015/06/europe-starts-taking-glyphosate-off-shelves/

http://www.i-sis.org.uk/Fallout_from_WHO_Classification_of_Glyphosate_as_Probable_Carcinogen.php

http://sustainablepulse.com/2015/06/03/swiss-supermarkets-stop-sales-of-glyphosate-over-health-concerns/#.VW70mmRVikp
http://www.ewao.com/a/1-the-netherlands-ban-monsantos-roundup

http://www.globalresearch.ca/sri-lankas-newly-elected-president-bans-glyphosate-monsanto-roundup-deadly-chronic-kidney-disease-increased-5-fold/5451936

Destroying Beneficial's? Not a "healthy" Integrated Pest Management (IPM) Plan!
http://www.centerforfoodsafety.org/andrew-kimbrell/2440/andrew-kimbrell/andrew-kimbrells-blog/3911/they-are-biocides-not-pesticides--and-they-are-creating-an-ecocide#

18-01 In conclusion the materials linked within this two (2)-page document, be it videos, research, news articles, are inclusive to this review and comment process being undertaken, and are my direct response to the Draft TPEIR.

Sincerely,
Kathleen Mulcahy
505 Larkspur Plaza Dr.
Larkspur, CA 94939
Email: krm711@gmail.com

RESPONSE TO COMMENT LETTER 18 - KATHLEEN MULCAHY, JULY 4, 2015

Response to Comment 18-1

Comments noted. Please refer to **Master Response 3 - Alternatives to Herbicide Use**.

Comment Letter 19

10 Andreas Court
Novato, CA 94945
July 5, 2015

James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903

Comments on the Vegetation and Biodiversity Management Plan Environmental Impact Report

James:

Below are my comments on the EIR for the Vegetation and Biodiversity Management Plan.

The EIR addresses the effect of different types of management on special-status species in Impact 5.1-1 but does not address the impact of the absence of management on special-status species that occur in grassland. See below for specific comments.

19-01 **Comment 1:** Most of the special-status plant species of Appendix B of the EIR occur in grasslands. If their habitat also includes woodlands, scrub, chaparral, or another type of woody vegetation, they occur in grassland openings within the woody vegetation, not under the canopy of the woody vegetation (unless the grassland was overgrown by woody vegetation). The woody vegetation eventually shades out these species.

19-02 **Comment 2:** The *Vegetation and Biodiversity Management Plan* (VBMP) includes a chapter on managing oak woodlands but does not include a chapter on management of grasslands, especially the sensitive native grasslands.

19-03 **Comment 3:** These grasslands are subject to succession in which the grassland changes to woody vegetation over time. Grazing management slows this change but does not completely prevent the conversion of grassland to woodland based on my observations of the growth of coast live oak and other species of trees at the Mount Burdell Open Space Preserve. The EIR does not address the effect of successional change on special-status grassland plant species.

19-04 **Comment 4:** Successional change of the vegetation of the open space preserves is likely to result in a reduction in biodiversity in the open space preserves, and Marin County as a whole, as grassland becomes converted to woodland. As an example, the location of the locally rare *Monolopia major*, on the Mount Burdell Open Space Preserve, is surrounded on three sides by oak woodland and its occurrence is threatened by succession. The EIR does not address the effect of succession on a reduction of biodiversity.

19-05 **Comment 5:** Goals should be established for each of the grassland areas with respect to the desired type of vegetation to be maintained over time. By at least keeping these areas as grassland, the special-status species that occur in them may persist over time. In addition, by establishing goals for each grassland area, the sensitive grassland types can be maintained without experiencing vegetational succession. The EIR does not address the effect of succession on sensitive grassland.

19-06

Comment 6: The northern spotted owl is an iconic species that occurs in some of the open space preserves and an important part of Marin County's biodiversity. It is threatened by the colonization of its habitat by the barred owl. Breeding by northern spotted owls has declined over most of its remaining habitat due to the barred owl. The EIR and the VBMP should address the control of the barred owl to allow the northern spotted owl to survive on Marin County open space preserves.

Below are editorial comments.

19-07

Pg 108 of EIR – Marin western flax is not a chaparral species.

Pg 109 of EIR – marsh wrens do not typically occur in coastal salt marsh but in the tules and cattails of freshwater marsh and possibly brackish marsh.

Pg 111 of EIR - The non-native Italian thistle (*Carduus pycnocephalus*) is much more common in non-native grasslands than is the non-native bull thistle (*Cirsium vulgare*).

Pg 112 of EIR - Current research indicates that California bay trees transmit most of the SOD infections to coast live oak and black oak, coast redwood has transmitted SOD in a few instances, and tan oak transmits SOD to adjacent tan oaks and coast live oaks. Other hosts of SOD appear to play a minor if any role in transmitting the disease.

Pg 112 of EIR - The difference in cover between woodland and forest should be mentioned in the Oak woodland and Oak/Bay Forest sections. Oak/Bay Woodland is mentioned in the Oak/Bay Forest section and the difference between woodland and forest should be explained.

Pg 117 of EIR - Grasshopper sparrow not shown on Mt. Burdell

Pg 118 of EIR - The occurrence of Baker's navarretia does not appear to be shown on the figure.

Appendix B – Special-status insects need to be added. Marin elfin butterfly, *Trachusia gummifera*, Opler's longhorn moth, and two boring beetles that occur in Sargent's cypress trees.

Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*) – James Reveal, the taxonomist that described the Tiburon buckwheat has said that he considers it to only occur on the Tiburon Peninsula. Specimens from other locations should be compared to those of the Tiburon Peninsula, to ensure proper identification.

For the locally rare and list 3 and 4 species, *The Marin Flora* and the Consortium of California Herbaria website http://ucjeps.berkeley.edu/consortium/ can provide locations.

For instance the Consortium's web site indicates that the only known Marin County location for *Calystegia collina* ssp. *oxyphylla* is on Carson Ridge west of Fairfax.

From my memory, other locations of locally rare and list 3 and list 4 species are:

Calochortus umbellatus – Ring Mountain, Mt. Tamalpais

19-07 (cont.)

Calochortus uniflorus – Ring Mountain

Calycadenia truncate – Mt. Burdell is the only Marin County location

Dichondra occidentalis – Deer Island

Leptosiphon acicularis – Indian Valley and Mt. Burdell

Lewisia reduviva – Mt. Burdell

Navarretia cotulifolia – Mt. Burdell is the only known Marin County location

Ranunculus lobbii – Mt. Burdell at Hidden Lake

Toxicoscordion fontanum – Ring Mountain, Old Saint Hilary's Preserve

Monolopia major – a common plant, whose only Marin County occurrence is on Mt. Burdell, should be added to Appendix B Biological Resources: Potential for Plant and Wildlife Species to occur in the MCOSD Preserves.

Lessingia hololeuca – a rank 3 plant should be added to the list of special-status species of Appendix B. It occurs at Roy's Redwoods.

Pg 126 – State-protected wetlands should be added to the significance criteria. An impact would be significant if it were to affect a state-protected wetland.

Please contact me if you have any questions.

Sincerely,

Clinton Kellner, Ph.D.

RESPONSE TO COMMENT LETTER 19 - CLINTON KELLNER, PH.D., JULY 5, 2015

Response to Comment 19-1

The commentor states that the draft VBMP does not address succession of grassland to scrub and woodland, believes the draft VBMP needs to be expanded to address this loss of grassland habitat and its effect on grassland-dependent special-status species and loss of native biodiversity, and include BMPs for vegetation management to retain grasslands. The process of grassland conversion, both from natural succession by native woody species and as a result of establishment and spread of invasive species, is not the result of some direct management practices of the District that would trigger CEQA review. There would be no potential impact to consider under CEQA related to this concern over grasslands habitat management, and no revisions to the Draft TPEIR are considered necessary in response to these comments. The potential impacts of implementing the VBMP on biological resources, including sensitive natural communities such as native grasslands, are fully in the Biological Resources section of the Draft TPEIR. Also please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 19-2

The commentor is mistaken when he states that the VBMP includes a chapter on oak woodlands but not on the management of grasslands. Chapter 4 of the VBMP provides a framework for vegetation and biodiversity management. It includes a section that address forest health management, mainly dealing with pathogens, and a section that deals with the protection and restoration of natural resources, including native grasslands. To assist with management of resources on MCOSD land, the plan creates a vegetation zoning system. The plan provides for the restoration and preservation of natural resources, including native grasslands. To assist with management of resources on MCOSD land, the plan creates a vegetation zoning system. The plan identifies most native grasslands as either Legacy or Sustainable Natural System Zones, and requires the MCOSD to provide the highest priority for protective management to vegetation in the legacy zone and requires protective management for vegetation in the Sustainable Natural Systems Zone.

Please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 19-3

Please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 19-4

Please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 19-5

Please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 19-6

The commentor states that VBMP and TPEIR should address the control of barred owl given its impact on northern spotted owl in Marin County and throughout most of its range. Although maintaining and enhancing native biodiversity are important objectives, the VBMP achieves these through vegetation management programs such as treatment activities to control invasive plant species, not invasive animal species. Appropriate BMPs have been included in the VBMP where management activities could adversely affect essential habitat for northern spotted owl, such as **BMP-Special-Status Wildlife Species-2** to avoid and protect nesting territories on MCOSD preserves. The threats to northern spotted owl posed by barred owl is an existing condition, not the result of or an impact from implementation of the VBMP, and no further analysis in the Draft TPEIR or revisions to the VBMP are considered necessary.

Response to Comment 19-7

The commentor provided a number of editorial comments reviewed as follow:

Marin western flax is not exclusively associated with chaparral habitat, but is known from stands of serpentine chaparral in Marin. The reference to Marin dwarf flax being found in chaparral on page 108 of the Draft TPEIR was not intended to imply that it is endemic to chaparral habitat.

The commentor is correct that marsh wren is typically not associated with coastal salt marsh habitat. In response to the comment, the reference to marsh wren in the second paragraph, fifth line on page 109 of the Draft TPEIR is revised as follows:

> "…northern harrier and other raptors, Virginia rail, American toot, shorebirds, <u>and</u> swallows. ~~and marsh wren~~…"

The commentor is correct that non-native Italian thistle is much more common in non-native grasslands than non-native bull thistle. But bull thistle can be found in non-native grasslands and no change to the reference on page 111 of the Draft TPEIR is considered necessary.

As noted by the commentor, current research indicates that California bay is a major host and known to transmit most of the SOD infections to coast live oak and other affected species. The discussion on page 112 of the Draft TPEIR is intended to provide general background information on SOD and the risk its continued spread poses to native oak woodlands.

The descriptions of oak woodland and oak/bay forest on page 112 of the draft TPEIR are intended to generally characterize the range of cover types where oak and other species form the dominant cover. The structure of woodland tends to be much more open than forest, but conditions can range considerable, and no revisions are considered necessary.

The commentor questions whether occurrences of grasshopper sparrow and Baker's navarretia were included in **Exhibits 5.1-2** and **5.1-3** in the Draft TPEIR. MCOSD staff have confirmed that both species occur at the Mt. Burdell preserve, that grasshopper sparrow has not been mapped, but occurrences of Baker's navarretia have been mapped. Both species are included in **Table B.3** in **Appendix B** to the draft VBMP, and Baker's navarretia is shown as occurring at the Mt. Burdell preserve in **Table B.4** of **Appendix B** to the draft VBMP.

The commentor states that several special-status invertebrates need to be included in **Table B-3** in **Appendix B** of the draft VBMP. Marin elfin butterfly and *Trachusia gummifera* are actually included in **Table B-3**. The other invertebrate species will be included in updated species data reflected in **Table B-3**, including Opler's longhorn moth (*Adela oplerella*). However, the MCOSD could not identify any special status boring beetles that occur in Sargent's cypress trees. Therefore, the boring beetles will not be added to **Table B-3.**

The commentor refers to information from Marin Flora and Consortium of California Herbaria for use in confirming the locations of locally rare and CNPS List 3 and 4 species. The MCOSD uses these two information sources in developing their locally rare data. Most of the List 3 and 4 species mentioned by the commentor are in fact included in **Tables B.3** and **B.4** in **Appendix B** of the draft VBMP, but four are not and will be added to these tables by the MCOSD. These consist of: large flowered star tulip (*Calochortus uniflorus*) – maintained on List 4.2 of the CNPS *Inventory*; Rosin weed (*Calycadenia truncate*) which has no CNPS listing but is considered locally rare; western dichondra (*Dichondra occidentalis*) which is maintained on List 4.2 of the CNPS I*nventory*; and Bitter root (*Lewisia rediviva*) which has no CNPS listing but is considered locally rare. The MCOSD uses criteria from the California Native Plant Society (CNPS) and other current scientific literature to determine whether a species is considered locally rare. A variety of factors including species-specific characteristics, available suitable habitat, as well as land use activities and practices, all play a role in determining whether a species that is relatively common in one part of its range is rare in another part of its range. The MCOSD maintains databases of all known plant and animal species. These databases are regularly updated as new species are identified or confirmed.

The commentor points out that significance criterion regarding wetlands in bullet three on page 126 of the draft TPEIR references only federal waters, and believes that state waters need to be included as well. Some state waters regulated under Porter-Cologne by the Regional Water Quality Control Board are not federally regulated, state waters regulated by CDFW and the California Coastal Commission extend above federally regulated waters even though the text from this significance criterion is taken directly from Appendix G of the *State CEQA Guidelines*. The MCOSD concurs that State waters should be included in the criterion. In response to the comment, the significant criterion under the third bullet on page 126 of the TPEIR has been revised as follows:

- Have a substantially adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to, marsh, vernal pool, coastal, etc.) <u>and State Waters regulated under the Porter-Cologne Act State Fish and Game code, and, for those projects in the designated coastal zone, the California Coastal Act</u>, through direct removal, filling, hydrological interruptions, or other means.

Comment Letter 20

Raives, James

From: carol fagan <carolffagan@gmail.com>
Sent: Sunday, July 05, 2015 11:09 PM
To: Raives, James
Cc: Kinsey, Steven
Subject: Comments on draft TPEIR

Dear James,

20-01

As a long time user, a homeowner, a taxpayer and a concerned voting citizen of Marin County I object to any destruction or closure of currently existing trails in MCOSD or MMWD lands. Could you please focus on more land acquisition and maintenance of fire roads instead? I also vehemently object to signage, policing or obstructing citizens from off trail use except in individual small areas adjacent to existing trails that cause erosion (aka "short cuts"). This is not state or federal park land. This is OPEN SPACE and as such should be left alone. I voted for Measure A under the illusion it would provide funds to acquire more land not more destruction of land or use. The exposure of the destruction of the trail in San Geronimo sent shock waves through our community and I am certain that the voters will be very reluctant to continue to vote for future ballot measures should these practices continue.

Sincerely,

Carol Fagan

cc: Steve Kinsey

RESPONSE TO COMMENT LETTER 20 - CAROL FAGAN, JULY 5, 2015

Response to Comment 20-1

This comment is in reference to the closure of an illegally constructed trail and related issues considered in the *Road and Trail Management Plan*, and not on the adequacy of the Draft TPEIR for the VBMP.

Comment Letter 21

Tiburon, July 6, 2015

James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903-4157

Re: MCOSD's Draft Tiered Programmatic Environmental Impact Report (TPEIR) for the Draft Vegetation and Biodiversity Management Plan (VBMP)

Dear Mr. Raives:

The following comments are submitted regarding the above referenced documents. Because there are erroneous facts and statements in the VBMP and there is no intention to rewrite it (Mischon Martin, MCOSD), the comments below need to be addressed in the TPEIR. As a botanist and resident of Tiburon, many of my comments concern the two preserves located on the Tiburon Peninsula – Old St. Hilary's and Ring Mountain.

In general, the VBMP is a detailed and elaborate plan to manage vegetation in order to increase biodiversity, protect sensitive resources, and reduce fuel-loads on MCOSD preserves. However, it appears overly ambitious at times and would benefit from careful consideration of what is actually "doable," in view of the fact that any vegetation and biodiversity management program will be constrained by limits of funding and staff (TPEIR p. 55). Better coordination between or among activities might benefit the vegetation management on the preserves.

Table 4.1 (VBMP**)** recommends preventing the spread of invasive species in Zone 4, the "Highly Disturbed" zone." This should not be proposed as a goal, when invasive plants are widespread in the other three, less "disturbed" zones. This is an example of what is likely not “doable” due to lack of adequate funding and staff resources. Available resources for weed removal should be spent on Zone 1 and 2, and potentially Zone 3 - not on Zone 4, despite the fact that “early detection/rapid response” is of great importance in containing invasive species.

Surveys/Monitoring

21-01

The VBMP states that monitoring of all federally- and State-listed species will take place on a yearly basis, according to the guidelines in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (Elam, et al. 1998) (p. 6-11), but other rare plant populations will be monitored every two to four years. A vegetation management plan, which claims to have as its goal to protect sensitive natural resources, including special-status species, should consider it a priority to monitor all rare plants, including plants on California Native Plant Society (CNPS) lists and locally rare species. Thus, the TPEIR should propose that to prevent invasion/displacement by non-native species, especially annual grasses, *all* rare plant populations need to be visited on a yearly basis, as the grasses can overrun a rare-plant colony in one year. **Table 4.4** states that MCOSD staff would “review invasive plant priorities on an annual basis,” identifying which infestations should be targeted for removal in the upcoming year. It is not clear, if this task would involve surveys of perhaps 1000’s of acres per year. If that is the case, it is a project that would likely not be doable due to limited funds and staff. It would be practical and beneficial to coordinate the selection of sites to visit for weed removal with those sites that support special-status species, *i.e.*, <u>combining surveys for weeds and rare plants</u>. This would at least assure the greatest protection of special-status species/sensitive communities on the various preserves. (Managing for fuel loads is a separate activity)

Invasive plants

The VBMP and TPEIR fail to address the greatest threat to native vegetation in Marin County, namely non-native, annual grasses. The goal of the plan and MCOSD’s primary

21-02 land management focus is “preserving habitat biodiversity and function” (TPEIR, p. 53). It is a disconcerting fact that few people see and/or acknowledge that the greatest threat to native plant communities/habitats is annual grasses. **Table 4.7** *Recommended Treatment Option for Target Invasive Species* lists only barbed oatgrass (*Aegilops truncialis*), an invasive annual species with limited distribution and as such should be contained. Medusahead (*Taeniatherum caput-medusae*), also an annual grass with a relatively restricted distribution in Marin County, is erroneously listed as a perennial grass in the Table 4.7. However, the most widespread and destructive species to native plant communities - wild oats (*Avena* spp.), Italian wildrye (*Festuca perenne*(=*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), dogtail grass (*Cynosurus echinatus*), and rattlesnake-grass (*Briza maxima*) - are not included in the table. These five grasses are ubiquitous on MCOSD preserves (VBMP, **Table C.1** *Nonnative Plant Species known to Exist on Preserves*) and unless they are addressed in management programs, spending funds and manpower resources on other invasive species, mainly perennials such as French broom (*Genista monspessulana*), fennel (*Foeniculum vulgare*) and Harding grass (*Phalaris aquatica*), is unlikely to be effective in preserving/restoring habitat for native species or increasing biodiversity. The TPEIR needs to explain the concept of biodiversity and why it is important to the health of an ecosystem. The public needs to be educated on why French broom is not a “pretty bush.”

21-03 Furthermore, why is puncture vine (*Tribulis terrestris*) - restricted mainly to roadsides in the northwestern part of the County (Marin Flora 2007), reported from three preserves (Table C.1), and not included in the *California Invasive Plant Inventory Database* (Cal-IPC) - an item in a list of supposedly “priority species” to be controlled/eliminated? (It should be a candidate for removal but not to the exclusion of more aggressive weeds.) Conversely, weeds such Italian thistle (*Carduus pycnocephalus*) (28) and hairy dandelion (*Hypocharies radicata*) (27) are not slated for removal. Italian thistle, occurring on 28 preserves and in many plant communities, is considered a noxious weed (Cal-IPC) (TPEIR p. 82, Policy BIO–1.6 (Countywide Plan)). *Notes* in Table 4.7 state that the species listed are those that have been successfully treated by “leading agencies across the Bay Area.” Why would only such species be included in the list of

21-03 (cont.)

target species? In order to promote biodiversity and protect sensitive resources, the goal and purpose of the VBMP, those species that occur on a particular preserve in Marin County, and are detrimental to the native vegetation in the County, should be the target species for control/elimination. Australian fireweed (*Senecio (=Erechtites) sp.*) is another such species, found on 15 preserves. *Senecio glomerata* is not marked as present on the Ring Mountain preserve (Table C.1), where it does occur (pers. observation). (This weed has been present for at least three years and would have benefitted from an "early detection/rapid response.")

21-04 (cont.)

Although herbicides appropriate for annual grasses are listed in the TPEIR (p. 254), such as Fusilade DX and Garlon 4 Ultra, there is little discussion of when and how to apply these herbicides and , most importantly, whether there will be vegetation restoration after "everything" has been killed – or – how to remove the dead shrubby plants, especially broom. **BMP** – *Hydrology and Water Quality* (pp. 32-33) states that revegetation will *immediately* rehabilitate areas where project actions have disturbed soil. The next sentence states: areas disturbed by equipment or vehicles will be rehabilitated as *quickly as possible* to prevent erosion, discourage the colonization of invasive plants, and address soil compaction. It is not clear what "immediately" and "as quickly as possible" imply. Could the latter mean months or years? And does the BMP include the disturbance of soil from weed-removal or the result of herbicide-spraying baring the soil? In terms of establishing native vegetation, it makes a great difference when revegetation takes place after substrate disturbance. Revegetation "immediately" after soil disturbance is preferable. "Immediately" and "as quickly as possible" need to be qualified with respect to time. And considering limited funds and staff, where will vegetation restoration be plausible?

Management programs to control these invasive grasses need to be developed at least for those preserves, where special-status species are being threatened or outcompeted by annual grasses, as is the case on the Ring Mountain, Old St. Hilary's, and Mount Burdell preserves.

Potential for Occurrence of Special-status Species

21-05

To be useful, **Appendix B, Biological Resources** (TPEIR) *Potential for Special-status Plant and Wildlife Species to occur in the MCOSD Preserves* (B-22 to B-31), needs to be edited. This table, which supposedly will guide special-status plant surveys, contains errors, both in terms of material included under the heading *Habitat*, and incompleteness under the heading *Potential for Occurrence.* (The title should include "present" as some of the species are listed as present.)

The "Habitat" column lists the blooming period of the species in question, obviously not a habitat feature, and it is not clear what "located in" refers to in many instances [see Seaside bittercress (*Cardamine angulata*); San Francisco Bay spineflower (*Chorizanthe cuspidata* var. *cuspidata*)]. Is it the plant's location or the habitat's location?

The term "suitable habitat," used throughout the table in the *Potential for Occurrence* column, should be replaced with "potentially suitable habitat" or "potential habitat." There is not enough known about the "suitability" of habitat for various plants with respect to the mineral content, microbial fauna, mycorrhiza relationships, etc. necessary for the plant to thrive. In addition, plants that are known to be geographic or endemic species should not be presented as potentially present on "other preserves," as is suggested by stating that "suitable habitat is present on other preserves." Rare-pant surveys are time-consuming (and expensive) and should not be conducted for plants known to be restricted to a certain preserve or soil type.

Furthermore, the table is incomplete. From p. B-22 to the next to last entry on p. B-26, the last column shows the potential for occurrence based on habitat present on a specific preserve. As of the last entry on this page, the estimate of potential for occurrence has been replaced by the phrase "Occurrence data is not available for this species." An estimate of "potential for occurrence" should not be dependent on the presence of occurrence data, therefore, this table needs to be completed. The habitat for the species should have been gleaned from *Marin Flora* (Howell et al. 2007) and the latest edition of the *Inventory of Rare and Endangered Plants of California* (CNPS). Also, there are plant lists to be consulted for the Ring Mountain and Old St. Hilary's preserves, assembled by the Marin Chapter of the California Native Plant Society (see CNPS website).

My comments on specific species apply mainly to the Ring Mountain and the Old St. Hilary's preserves. I find inaccuracacies in the two documents for these preserves and would therefore question the data for the other 32 preserves. If management activities will be carried out based on the information in the table (Appendix B), the information needs to be checked for facts and the table potentially updated.

21-06

The following are some comments on specific plants included in the table:

- Tiburon mariposa lily (*Calochortus tiburonenses*) is known to be endemic to Ring Mountain; therefore, suggesting that there is "suitable serpentine grassland habitat" on other MCOSD preserves is unjustified.
- Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*) is a serpentine endemic, thus cannot occur on the Bolinas Lagoon preserve, where there is no serpentine substrate.
- It is inappropriate to state that Marin western flax (*Hesperolinon congestum*) occurs "near the MCOSD." In this case, those preserves should be listed. ("Near the MCOSD" is also incorrect wording.)
- Potential for occurrence for the Tiburon jewelflower (*Streptanthus glandulosus* ssp. *niger*) is stated as "High." It further states that this species "historically occurs on the Tiburon peninsula." This species is *present* and is *endemic* to the peninsula! (See **Table 2.1** (VBMP) p. 2-21.) The potential for occurrence elsewhere is, therefore, non-existent, and to suggest that suitable habitat is present elsewhere is unjustified.
- Serpentine reed-grass (*Calamagrostis ophtidis*) (Table 2.1) and Carlotta Hall's lace fern (*Aspidotis carlotta-halliae*) and are present on the OSH preserve (see CNPS plant list).
- Oakland star-tulip (*Calochortus umbellatus*) (Table 2.1) and pink star-tulip (*C. uniflorus*) are present on Ring Mountain (see CNPS plant list).

21-06 (cont.)

- White-rayed pentachaeta (*Pentachaeta bellidiflora*) is listed as "Present" on King Mountain. If in fact it is present, it is reintroduced on the preserve and should be listed as such. This species has been considered extirpated from Marin County for many decades (Howell et al. Marin Flora 2007); however, there is a historic site on the preserve (also mentioned in Table 2.1).

21-07

Table B.1 (VBMP) *Vegetation Types on Preserves*. This table contains information that would not be helpful in the management of sensitive vegetation, including special-status species, and surveys for these resources.

For example: **Map # 3223**, with vegetation types *Coyote Brush and Mixed Shrub / Grass (May include Poison Oak or California Blackberry with mixture of grass spp*.) are highly unlikely to support the special-status species listed as associated with these vegetation types such as *Eriogonum luteolum* var. *caninum, Hesperolinon congestum*, *Navarettia heterodoxa*, *Streptanthus glandulosus* ssp. *niger*. Similarly, **Map #2210** *Oregon Oak Alliance (Includes Oregon Oak mixed with lower to equal Coast Live Oak to California bay cover*) vegetation types will not support *Streptanthus glandulosus* ssp. (*sic*) *pulchellus*, **unless** the soil type is included. These plants all occur on serpentine substrates and should only be included in vegetation types with serpentine soils.

Map #4210 shows the vegetation types *Sedge and Rush and Wet Graminoids Meadow (Including Juncus, Carex, and Meadow barley*) with associated species including *Hesperolinon congestum* and *Navarretia leucocephala* ssp. *bakeri*. *Hesperolinon congestum* is a serpentine grassland/rocky outcrop (bald) species and would not grow in the same habitat as *Navarretia leucosephela* ssp. *bakeri*, a *vernal pool* species.

Map # 9401, Serpentine Balds, a habitat where *Hesperolinon congrestum* actually grows, does not include this species; it only lists Tamalpais jewelflower (*Streptanthus glandulosus* ssp.(*sic*) *pulchellus*) (species should not be mentioned under "Vegetation Type.") Tiburon jewelflower (*Streptanthus glandulosus* ssp. *niger*) and Tamalpais

21-07 (cont.)

jewelflower (*S. batrachopus*) grow in rocky serpentine habitats (see Appendix B), and should be included here.

The most nonsensical entries are **Maps #3210, 9100, and 9250** with *French Broom Alliance (May include low cover of Coyote Brush), Urban Developed and Built Up, and Eucalyptus* listed as vegetation types with the associated special-status species *Pentachaeta bellidiflora*, a serpentine plant considered extirpated in Marin County. Even if there is an introduction site on King Mountain, none of the vegetation types listed would support the species in question.

Where was the above information obtained? It is not clear in the TPEIR how it would be used in vegetation management on MCOSD preserves.

Miscellaneous Erroneous Facts and Statements

Table B.2 (VBMP) *Vegetation Types Presented by Preserve* states that there are 52.8 acres of "Urban Development or Built Up" on the Old St. Hilary's preserve. This statement is incorrect; there is no development on the OSH preserve (Scott Anderson, Director of Community Development, Town of Tiburon). This fact should be reflected in the acreage in Exhibit 5.1-1.

21-08

Table B.3 (VBMP) *Special-Status and Other Species of Special Concern that are Known to or Could Exist on Preserves* states that *Thermopsis macrophylla* is present on the Ring Mountain preserve. The plant occurring on this preserve is *Thermopsis californica*, common false lupine, a common species (also see Table B.4).

Table B.4 (VBMP) *Special Status Species Known to Exist on Preserves* should show that *Calamagrostis ophitidis* occurs on Old St. Hilary's preserve, and *Trifolium amoenum* is extirpated on the Ring Mountain preserve (historical record).

21-08 (cont.)

The **TPEIR** (pp. 108 -111) *Natural Communities and Cover Types,* in reference to Serpentine Grasslands or Grasslands states: “Serpentine soils have unusually high levels of some minerals important to plant growth; as a result, serpentine plant communities are often unusually rich in native and endemic species.” The very opposite is the case in terms of minerals! A serpentine soil is low in calcium and high in magnesium – an unfavorable ratio for plant growth - and contains minerals that are toxic to most plants such as cobalt and nickel. It is true that this soil type supports endemic species, but not because the minerals are “important,” but because plants have evolved adaptations making it possible to survive on this soil type. Most plants cannot grow on serpentine soils. This section should be revised to reflect this misstatement.
Some other statements (and there are others) in this section that need revised language are:

- Under Douglas-fir/Redwood forest – are there other preserves than those listed that support this plant community? If not, the word “including” should be replaced with “are.”
- Under Oak Woodland – replace “includes habitat” with “is” (by definition oak woodland is a habitat!); replace “fungus” with “fungus-like organism” (or oomycete).
- Under Oak/Bay forest – replace this “habitat” with this “community.” The habitat does not include forests! The forest is habitat for…..

Be consistent with the repetition of scientific names in the various vegetation types!

Table 2.1 (VBMP**)** *Summary of Preserve Conditions***,** p. 2-21, states under *Sensitive Natural Resources* for Old St. Hilary’s preserve: “*Preserve contains “one of the most interesting and beautiful wildflower gardens in California, and thus in all the world*.” (John Thomas Howell, author of *Marin Flora*.) This statement is true for the 4-acre preserve around Old St. Hilary’s Church, which is owned by the County but managed by the Tiburon-Belvedere Landmarks Society. It is not part of the Old St. Hilary’s Open Space preserve; consequently, the quote does not apply.

21-08 (cont.)

Table 7.5 *Best Management Practices Related to Control of Invasive Plants*. **BMP-INVASIVE PLANT-3** states: "*Avoid establishing staging areas in areas dominated by invasive plants*. *If populations of priority invasive plants occur within or near staging areas, flag their perimeters so that vehicle and foot traffic can avoid them."*

This stipulation stating "avoid" needs an alternative. It should be obvious that staging areas should not be located in "native" vegetation, and rarely are there areas devoid of vegetation where equipment can be placed during construction. In that sense, avoiding weedy areas is not "doable." Instead, careful cleaning of equipment after parking in weedy area, which of course is a mandate, should be stressed.

BMP – **SPECIAL-STATUS PLANT –** 1 states that "*Surveys will be conducted within 14 days of the start of active ground disturbing activities*." This is <u>not acceptable for special status plants</u>! Surveys must be timed appropriately so that the plant is identifiable. Annual species are identifiable during a much shorter period than perennial plants, and surveys must be timed to "observe" them when in bloom or in "recognizable" fruit. This BMP needs revision.

The BMP further states that "*If full avoidance is not possible, restrict work to the period when special-status plants have flowered or set seed."* In view of the following stipulation of the BMP: "*If impacts cannot be avoided, contact the USFWS and/or the DFW to obtain the necessary permits before initiating vegetation management activities."* it appears that the first stipulation is not necessary and should be deleted. If ground disturbance from construction will take place, seed need to be collected during the appropriate time, stored and spread at the site or another more appropriate site, likely in consultation with the agencies.

Fuel breaks

21-09

Exhibit 5.4-13 depicts a wide-area fuel-break at Old St. Hilary's preserve that encompasses the <u>entire preserve</u>! The TPEIR states (p. 235): "*The treatment areas would reduce vegetation fuels within areas closest to adjacent residences and remove*

21-09 (cont.) *populations of invasive broom. This wide-area fuel break would provide the benefit of combining a treated area with a fire road, a combination that would help facilitate fire-fighting activities*." How wide is the "area closest to adjacent residences?" This preserve consists of mainly grassland and rocky serpentine slopes, which support federally- and State-listed species. The statement may refer to broom, but a few native shrubs are also present, including leather oak (*Quercus durata*) and a hybrid oak with a potentially important biological and cultural history. These species should not be removed for fire safety! Broom is not present along the fire road but is being removed elsewhere by a volunteer group. (I have seen the devastation along fire roads, both on MCOSD and Mt. Tam State Park lands, where native shrubs have been demolished in the name of fire safety.) For this particular preserve, the text needs to refer to "broom" only, and not to "vegetation fuels."

Herbicides

21-10 The section **Hazards – Herbicide Use (**TPEIR, pp. 243-271) is well researched and presented; however, the conclusion stating *No or Less-than-Significant Impacts* may be unjustified in view of the recent WHO report, based on the conclusion by International Agency for Research on Cancer (IARC) that glyphosate is a "probable human carcinogen," and the decision reached by the MMWD, as they have supposedly withdrawn the intent to use herbicides on their lands. (The VBMP (pp. 3-19) states that the MCOSD will "….build upon the extensive knowledge base that MMWD has created.") It would also be prudent to wait until U.S. Environmental Protection Agency (EPA) completes its current review of glyphosate, which is expected by the end of 2015. The section presenting various aspects of herbicides (pp. 364-365) under *CUMULATIVE IMPACT ANALYSIS* uses words like "practically," "generally," "likely," "unlikely," "approximately," and likelihood" when referring to effects of herbicide use, indicating that conclusive data are not available or current as of today.

Chemical methods to control/eradicate weeds will and should be used on MCOSD preserves, but the TPEIR needs to be updated to reflect recent information. It should

21-10 (cont.)

also stress that extreme caution needs to be used when designing "Conceptual Site Models" as they relate to fauna and humans, where buffer zones are not established. (The recent Ring Mountain controversy is a case in point.) **Exhibit 5.5-4** fails to consider humans as a "…non-plant ecological receptor.." The public needs to be notified, not only before a spraying event occurs but also after the event. The TPEIR should propose that the map showing where glyphosate has been sprayed be left in place and posted on the MCOSD website for a year so that visitors can check where spraying has occurred and avoid those areas, if desired.

21-11

The TPEIR fails to elaborate on <u>mitigation after invasive species have been eliminated by herbicides.</u> Such mitigation should discuss revegetation that includes planting of native species, monitoring, and weeding. **BMP – SPECIAL–STATUS PLANTS -4** states: <u>" *Immediately*</u> *rehabilitate areas where project actions have disturbed soil. Require areas <u>disturbed by equipment or vehicles</u> to be rehabilitated as <u>quickly as possible</u> to prevent erosion, discourage the colonization of invasive plants, and address soil compaction. Techniques include decompacting and aerating soils, recontouring soils to natural topography, stabilizing soils via erosion control materials, revegetating areas with native plants, and removing and monitoring invasive plants."* It is not clear if "revegetation" will occur after herbicides have killed the weeds or if the **BMP** refers only to rehabilitation after construction soil disturbance (same BMP as used in the R&T Management Plan.) And "immediately" and as "quickly as possible" need to be qualified.

Furthermore, will dead broom, a favorite target for herbicides, be removed to reduce the risk of fire, especially where the shrub provides a "ladder" to a tree canopy? Dead, dry shrubs present a greater fire risk than live plants.

It is my opinion that the TPEIR needs editing/abridging/formatting of many sections with respect to superfluous words and sentences, misused words, and faulty or non-standardized grammar and syntax**.** For instance, *PROJECT LOCATION* (TPEIR p. 49) needs editing, and the section "In ***Table 2.1*** **(***Summary of Preserve Conditions*)…" (p. 56) is partly illegible. **Exhibit 2.0-1** *Summary of Impacts and Mitigation Measures* is not a summary, *i.e*., a digest or synopsis, but instead a repetition (and very repetitive) of all mitigation measures (pp. 134-), presented with inconsistent grammar and syntax in a narrow column that is very difficult to read. Under **Mitigation Measure 5.1-1(a),** the section on *Conduct surveys to determine presence or absence of sensitive natural resources* (p. 135**)** contains repetitive language as do other sections. In the same exhibit, **BMP -** *Hydrology and Water Quality*, states: "*Reduce project impacts on the production of substantial quantities of polluted water runoff to bays and creeks*" (pp. 33-34). That surely needs clarification!

21-12

Lastly, the statement "*Based on the analysis completed as a part of the TPEIR, with the implementation of the VBMP, there would be no significant unavoidable environmental effects*" (p. 372), appears to be too robust with potentially limited funds and staff resources, large area and likely a great number of projects with many as yet unexplored or tested mitigation measures, and no definitive data on glyphosate. (*It must of course be the TPEIR conclusion!*) Hopefully, this conclusion and the goals of the VBMP will be realized!

Thank you for the opportunity to comment on the TPEIR for the VBMP.

Sincerely,

Eva Buxton

Botanist

RESPONSE TO COMMENT LETTER 21 - EVA BUXTON, JULY 6, 2015

Response to Comment 21-1

The commentor questions the feasibility of monitoring and treating invasive species that threaten occurrences of special-status plant species on MCOSD preserves given limited funding and need to prioritize risks and ability to accomplish all required treatments, and requests that the Draft TPEIR be revised to require that all rare plant populations need to be visited on a yearly basis as non-native grasses can overrun a rare plant occurrence in one year. The concerns of the commentor over the feasibility of accomplishing all of the management objectives in the VBMP are noted. **Table 4.4** in Chapter 4 of the draft VBMP does not actually specify that site visits would be performed on an annual basis, as suggested by the commentor. Instead, the draft VBMP indicates that "MCOSD staff will review invasive plant priorities on an annual basis". As an adaptive management plan, the VBMP will be continuously updated and priorities re-evaluated on an annual basis in addressing the goals and objectives, as discussed in Chapter 5, Plan Implementation, of the draft VBMP. Including a requirement in the Draft TPEIR that all rare plant populations be visited on an annual basis is unwarranted, may not be feasible, and is not recommended in response to the comment.

Response to Comment 21-2

The commentor points out the challenges with non-native annual grasses, states that the draft VBMP and Draft TPEIR fail to address this threat, and questions why many are not targeted for treatment. MCOSD does in fact target non-native grasses, along with other non-native species. This is referenced in the draft VBMP. No revisions to the Draft TPEIR are necessary in response to the comment. Also please see **Master Response 8 - Biodiversity Issues**.

Response to Comment 21-3

Commentor questions why puncture vine (*Tribulis terristris*) has been reported from three preserves and is included in **Table C.1** of the draft VBMP, as this species is not recognized by the California Invasive Plant Inventory database. The commentor also questions why widespread invasives, known from many preserves, are not included in the priority invasive plants in **Table C.2** of the draft VBMP. Some species on this list in **Table C.1** are a problem for MCOSD, such as puncture vine, but may not be a problem at the state level. In response to the comment, the MCOSD will add wild oats (*Avena* spp.), Italian wildrye (Festuca perenne (=*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), dogtail grass (*Cynosurus echinatus*), and rattlesnake-grass (*Briza maximum*) to **Table 4.7** in Chapter 4 of the draft VBMP. The listing of medusahead (*Taeniatherum caput-medusae*) as a perennial species will be revised as an annual grass in **Table 4.7**. The MCOSD will add Australian fireweed (*Senecio* (=*Erchites*) *minima*) to **Table C.1** and indicate it as present on Ring Mountain preserve, as observed by the commentor. The MCOSD is continuously updating information on target invasive plant species known or suspected to occur on its preserves, and will update this data to reflect current threats and the adaptive management objectives integral to implementation of the VBMP.

Response to Comment 21-4

The commentor states that management programs are needed to control invasive grasses, at least on those preserves with grassland-dependent special-status plants or native grasslands being lost. The MCOSD staff are aware of the risks posed by invasive grasses on grassland-dependent special-status plant species, occurrences of native grasslands and other sensitive natural resources, including those associated with Ring Mountain, Old St. Hillary's and Mount Burdell preserves, as noted by the commentor. As an adaptive management plan, the VBMP will be continuously updated and priorities re-evaluated on an annual basis in addressing the goals and objectives, as discussed in Chapter 5, Plan Implementation, of the draft VBMP. The plan provides for the restoration and preservation of natural resources, including native grasslands. To assist with management of resources on MCOSD land, the plan creates a vegetation zoning system. The plan identifies most native grasslands as either Legacy or Sustainable Natural System Zones, and requires the MCOSD to provide the highest priority for protective management to vegetation in the Legacy Zone and requires protective management for vegetation in the Sustainable Natural Systems Zone.

The process of grassland conversion, both from natural succession by native woody species and as a result of establishment and spread of invasive species, is not the result of some direct management practices of the District that would trigger CEQA review. There would be no potential impact to consider under CEQA related to this concern over grasslands habitat management and conversion, and no revisions to the Draft TPEIR are considered necessary in response to these comments. The potential impacts of implementing the VBMP on biological resources, including sensitive natural communities such as native grasslands and occurrences of special-status plant species, are fully described in **Section 5.1 Biological Resources** of the Draft TPEIR. Also please see **Master Response 9 - Grassland Habitat Management**.

Response to Comment 21-5

The commentor expressed concerns over the table of special-status plant and wildlife species contained in **Appendix B** of the Draft TPEIR, which would need to be edited if used for monitoring purposes as part of implementing the VBMP. Appendix B is only used for general assessment purposes. The commentor had specific concerns about the use of the phrase "Occurrence data is not available for this species" for some species listed in Appendix B. The TPEIR uses this phrase to describe the presence of plant species that are listed by the California Native Plant Society as "Rank 4." Rank 4 species are not usually identified as special status species for CEQA purposes. However, there remains potential for these species to occur on MCOSD preserves, and more comprehensive lists would be considered (as required under relevant BMPs) in advance of conducting systematic surveys to confirm presence or absence of sensitive natural resources such as occurrences of special-status plant species before initiating habitat management activities associated with the VBMP. The MCOSD is continuously updating information on special-status species known or suspected to occur on its preserves, consistent with the monitoring and surveying efforts performed as part of the VBMP.

In response to this comment, the MCOSD will change Appendix B as follows:

~~Occurrence data is not available for this species.~~ <u>Potentially Present, a more detailed site-specific assessment will occur before implementing any project.</u>

Response to Comment 21-6

The detailed information provided by the commentor regarding special-status plant occurrences on the Tiburon Peninsula is noted, and the MCOSD will incorporate that useful information into their database, but this information does not affect the analysis and conclusions reached in the Draft TPEIR. Based on this comment, the MCOSD will make the following changes to Appendix B.

Tiburon mariposa lily *Calochortus tiburonensis*	FT; ST; Rank 1B	Valley and foothill grassland; located on open, grassy or rocky slopes derived from serpentine. Elevation range: 160 – 490 feet. Blooms: March – June.	**Present.** This species is known only from Ring Mountain.~~, though other areas in the MCOSD contain suitable serpentine grassland habitat.~~
Tiburon paintbrush Castilleja affinis ssp. neglecta	FE; ST; Rank 1B	Valley and foothill grassland; located in grassy, open areas and rock outcrops underlain by serpentine substrate. Elevation range: 195 – 1300 feet. Blooms: April – June.	**Present.** This species has been found at ~~Bolinas Lagoon~~, Old St. Hilary's, and Ring Mountain. Additionally, other areas of the MCOSD contain suitable serpentine grassland habitat.
Marin western flax *Hesperolinon congestum*	FT, ST, Rank 1B	Chaparral, valley and foothill grassland; located on serpentine substrate. Elevation range: 15 – 1205 feet. Blooms: April – July.	**Present.** This species has been found at Mt. Burdell, Old St. Hilary's, ~~and~~ Ring Mountain, Loma Alta, and Gary Giacomini. ~~and it occurs near the MCOSD in multiple other locations~~.
Tiburon jewelflower *Streptanthus glandulosus* var. *niger*	FE; SE; Rank 1B	Valley and foothill grassland; located on shallow rocky substrates derived from serpentine. Elevation range: 100 – 490 feet. Blooms: May – June.	**Present.** This species ~~historically occurs on~~ is endemic to the Tiburon Peninsula. ~~Suitable serpentine habitat exists on the MCOSD.~~
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE; SE; Rank 1B	Valley and foothill grassland; located on open, dry rocky slopes and grassy areas, often on substrate derived from serpentine. Elevation range: 110 – 2015 feet. Blooms: March – May.	~~**Present.** This species has been found at King Mountain and has been documented elsewhere near MCOSD land. The MCOSD also contains additional suitable serpentine habitat for this species.~~ **Low Potential.** This species is considered extirpated from Marin County, the last recorded siting in Marin County was in 1946 (Calflora)

Response to Comment 21-7

The commentor points out that many of the associations between vegetation and potential for presence of special-status species in **Table B.1** of **Appendix B** in the VBMP are not accurate or helpful, and the information should be updated. The MCOSD will incorporate this useful information into their database, but this information does not affect the analysis and conclusions reached in the Draft TPEIR. Also, please see Response to Comment 21-5.

Response to Comment 21-8

The commentor points out that **Table B.2** in **Appendix B** of the draft VBMP incorrectly includes 52.8 acres of urban development (Map #9100) at Old St. Hillary's Preserve. In preparing the vegetation maps, the District included some areas adjacent to the preserves to capture any special-status plants or invasive weeds on adjacent property. With respect to the Old St.

Hillary's Preserve, and many other preserves, most of the surrounding property is urban development. TPEIR.

The commentor also found a number of corrections to information contained in the draft VBMP and Draft TPEIR. **Table B.3** in **Appendix B** of the draft VBMP incorrectly states that *Thermopsis macrophylla* is present on Ring Mountain Preserve, when in fact it is *Thermopsis californica*, a common species. And **Table B.4** in **Appendix B** of the draft VBMP needs to be updated to show that *Calamagrostis ophitidis* is present on Old St. Hillary's Preserve, and that *Trifolium amoenum* is extirpated on Ring Mountain Preserve. The numerous suggested edits to various descriptions in the summary discussion of Natural Communities and Cover Types on page 108 to 111 of the Draft TPEIR do not change the analysis or conclusions in any substantial way, and no revisions are considered necessary. Regarding **Table 2.1** in the draft VBMP and the quote from John Thomas Howell regarding Old St. Hillary's preserve, this separately owned parcel managed by the Tiburon-Belvedere Landmarks Society is contiguous with the MCOSD preserve, and some attributes of the natural communities are common to both properties.

The commentor questions the appropriateness of **BMP-Invasive Plants-3** in the draft VBMP, which includes provisions to avoid establishing staging areas in locations dominated by invasive plants. The intent with this provision is to minimize introducing seed and other plant material into construction equipment and spreading it to other locations. Other BMPs and standard practices would serve to avoid siting staging areas and other construction-related facilities in locations with sensitive natural resources or areas with intact native cover when alternative locations are available for use. No revisions to the draft VBMP or Draft TPEIR are considered necessary in response to this comment.

Regarding the timing of preconstruction surveys for special-status plant species, the commentor raises a valid concern that surveying for special-status plants 14 days prior to the start of active ground disturbing activities in **BMP – Special-Status Plants – 1** is unacceptable. Most special-status plant species have to be identified during the flowering period, not in relation to when construction is scheduled to begin. In response to the comment, a new Mitigation Measure 5.1-1(c) has been included under *Impact 5.1-1* on page 136 of the Draft TPEIR as follows:

> ***Mitigation Measure 5.1-1(c)*** – To provide clarification over when surveys are to be conducted in advance of construction-related vegetation management, the first bullet in **BMP-Special-Status Plants-1**of the draft VBMP shall be revised as follows:
>
> - Surveys will be conducted during the appropriate time of year as necessary to allow for adequate detection, with follow-up surveys conducted as necessary within 14 days of the start of active ground disturbing activities.

It is unclear which BMP from the draft VBMP the commentor is referring to when she states that work is to be restricted "…to the period when special-status plants have flowered or set seed." However, any details regarding collection and salvage of special-status plant species would be refined through the development of a specific project and through consultation with appropriate experts. The VBMP is a comprehensive plan that address the goals and strategies for implementing the MCOSD's vegetation management program and it is not a plan that prescribes specific management actions. The MCOSD will develop future projects based on the program created by the VBMP, and these future projects will require subsequent CEQA compliance. No further revisions to the draft VBMP or Draft TPEIR are considered necessary in response to the comments.

Response to Comment 21-9

The VBMP is a comprehensive planning document designed to provide the MCOSD with strategies to implement vegetation management actions and is not a prescriptive plan that identifies specific treatment methods or locations. The wide-area fuel break depicted in **Exhibit 5.4-13** is an example of a project to construct a fuel break that covers the southern portion of Old St. Hilary's open space preserve (about 1/5th of the preserve area) to illustrate the types and locations of fuel breaks. This exhibit does not show a specific project that the VBMP requires. Additionally, Mitigation Measure 5.4-2 requires the MCOSD to develop wildfire protection plans for each preserve. These protection plans will be subject to subsequent CEQA review before the MCOSD can implement the site-specific plan. Please see **Section 5.1: Biological Resources** for more on the potential impacts of fire hazard and risk reduction work to natural resources and the practices that would be used to minimize those impacts down to acceptable levels.

Response to Comment 21-10

Please refer to **Master Response 2 – Use of Glyphosate**. Refer to Appendix E of the Draft TPEIR for conceptual site models for potential human exposure to herbicides. Postings and signage are discussed in **Master Response 5 - Herbicide Use**. Please also see Response to Comments 11-33 and 12-07.

Response to Comment 21-11

The commentor states that the Draft TPEIR fails to elaborate on mitigation after invasive species have been eliminated by herbicides, and references the provisions in **BMP-Special-Status Plants-4** that require areas disturbed by equipment or vehicles to be rehabilitated as quickly as possible to prevent erosion, discourage the colonization of invasive plants, and address soil compaction. Implementation of any management activities that would remove vegetation and disturb soil would be addressed through revegetation and other measures under the VBMP. Both **BMP-General-3** and **BMP-General-5** in the draft VBMP includes provisions to rehabilitate areas where project actions have disturbed soil, given the understanding that these are opportunities for establishment of undesirable invasive plant species. Areas where herbicide application or other treatment methods left the slope barren would be rehabilitate given the importance of preventing conditions that would encourage the spread of invasive plants. Details on monitoring and other provisions related to revegetation and restoration projects are described on pages 6-16 through 6-20 of the draft VBMP. No revisions to the draft VBMP or Draft TPEIR are considered necessary in response to this comment. As a program EIR, the TPEIR does not address project specific impacts, rather it relies on future CEQA compliance to address these effects. These subsequent CEQA reviews will consider the impacts from removal of invasive weeds on soil erosion and habitat. If the project results in significant impacts, the MCOSD will consider appropriate mitigation.

Response to Comment 21-12

The commentor states the opinion that the Draft TPEIR needs editing/abridging/formatting of many sections. The commentor provides some edits of portions of the Draft TPEIR that needs such additional work. The preparers of the Draft TPEIR acknowledge the commentors concerns. It is, however, noted that the concerns expressed by the commentor do not affect the analysis and conclusions reached in the Draft TPEIR.

Comment Letter 22

Raives, James

From: b emily <bemilysykes@yahoo.com>
Sent: Wednesday, July 08, 2015 3:07 PM
To: Raives, James
Subject: parks, open space and pesticides

Parks people,

22-1

Several years ago when I approached an Open space truck with what appeared to be pesticide spraying equipment I asked to talk to the person in uniform. I mentioned my opposition to pesticide use and that women who appeared to be in charge agreed with me. She said they had no policy about its use but "they voluntarily used other "tools".

Another time when the GGNRA attended a meeting at our HOA about sharing the clearance of invasive plants on an adjoining area of land next to our HOA I had another positive response. Another women in uniform and apparently in charge of clearing the area discussed the plans at which time she said they would paint the stumps of catoniaster with RoundUp. I said our HOA was pesticide free zone and we did not want GGNRA to use chemicals. She agreed and said they would not use the chemical.

I applaud these workers. Now lets get this policy to eliminate chemicals in writing so these workers are protected. By the way I personally checked the brush of the invasive plants and using the carpet method to curb their growth we have been successful in removing the disturbing plants.

Undoubtedly you have heard that last night the MMWD abolished the use of glyphosates for curbing growth on the watershed. Please join in the efforts to save lives, money and the environment by duplicating the efforts of MMWD.

Emily Sykes

RESPONSE TO COMMENT LETTER 22 - EMILY SYKES, JULY 8, 2015

Response to Comment 22-1

The commentor stated her opposition to the use of pesticides and recommended that the MCOSD follow the lead of MMWD and abolish the use of glyphosate. This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. It is noted, however, that **Master Response 2 – Use of Glyphosate** discusses the major topics of concern in detail regarding glyphosate and its use within the draft VBMP as an environmental management tool.

Comment Letter 23

155 Buena Vista Ave.
Mill Valley, CA 94941
July 8, 2015

James Raives
Marin County Open Space District
3501 Civic Center Drive, Suite 260
San Rafael, CA 94903-4157
JRaives@marincountyorg

Re: Public Comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report (State Clearinghouse No. 2013112063).

I am writing as a Marin County citizen concerned about the Marin County Open Space District's (MCOSD) current and proposed continued use of herbicides, most specifically glyphosate, as part of their Vegetation and Biodiversity Management Plan.

In March 2015 the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) found glyphosate (one of the active ingredients in Round-up, the world's largest selling herbicide), to be a probable human carcinogen and a known carcinogen when fed to laboratory animals.

In the wake of the WHO's determination and with growing scientific evidence of the health risks associated with this herbicide, glyphosate has been banned in Chicago, Paris, Vancouver, the Netherlands, Mexico Russia, Columbia, Denmark, Ecuador, Brazil and Sri Lanka.

At last night's (July 7, 2015) meeting of the Marin Municipal Water District, the Board unanimously adopted staff's recommendation that their draft Wildfire Protection and Habitat Improvement Plan (WPHIP) and associated EIR be revised by **removing the use of herbicides**, citing "…[r]ecent public discourse within Marin County [which] points to a growing apprehension towards exposure to herbicides in regards to their impact on watershed habitat, toxicity to wildlife, and human health." MCOSD should follow the lead of their sister county agency and similarly remove herbicides from their Vegetation and Biodiversity Management Plan.

Likewise our neighbor, the City of Richmond, banned glyphosate and all other pesticides in February 2015, even though it, like Marin County, had an Integrated Pest Management program, which sought to lessen reliance on toxic pesticides.

The following are a list of factors persuading the Richmond City Council to adopt a 12 month ban on all pesticides, including glyphosate, and to prepare a cost-benefit analysis of their land management experience under a no-pesticide regimen:

1. Well documented, scientific evidence that exposure to glyphosate causes an increase in birth defects, fetal deaths, cancer, DNA damage, kidney disease, autism and other serious illnesses;

2. Contrary to manufacturer Monsanto's claims, glyphosate does not readily biodegrade; it persists in soil and water for prolonged periods of time;

3. Glyphosate works by disrupting a plant enzyme involved in the production of amino acids that are essential to plant growth. This disrupting action kills plants indiscriminately – native and non-native plants alike;

4. Glyphosate has been linked to the demise of the monarch butterfly population;

5. Glyphosate is known to be lethal to amphibians, the most threatened class of animals in the world;

6. Glyphosate bio-accumulates over time in human and animal tissue.

23-01

All of the above are important factors which have not been given adequate weight or analysis in MCOSD's Vegetation and Biodiversity Management Plan and TPEIR. MCOSD does cite in a recent addition to its web page that the World Health Organization has determined that glyphosate should be classified as a "probable carcinogen to humans". However, it further notes that "[t]he full paper for the aforementioned determination has not yet been released", as if to cast doubt upon the validity of IARC's findings. In order to provide assistance to MCOSD, the following is a link to the full text of the IARC's March 2015 findings, published in the May 2015 issue of The Lancet Oncology (Vol. 16, No. 5, p 490-491): http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045%2815%2970134-8/fulltext.

Because of the PTEIR's failure to adequately address the above noted risks and significant environmental impacts of the use of glyphosate -- an identified probable human carcinogen by the IARC -- and other toxic herbicides on MCOSD lands, the MCOSD Vegetation and Biodiversity Management Plan and its TPEIR should be revised and re-circulated to adequately analyze the above noted significant environmental impacts and to propose adequate mitigation measure for such impacts.

Sincerely,

Kerry Stoebner

Kerry Stoebner

RESPONSE TO COMMENT LETTER 23 - KERRY STOEBNER, JULY 8, 2015

Response to Comment 23-1

Please see **Master Response 2 – Use of Glyphosate** for a discussion of glyphosate toxicity, safety, environmental fate, endocrine disruption, and the WHO's conclusions regarding glyphosate.

Comment Letter 24

Raives, James

From: Larry Rose <larryrosemd@sbcglobal.net>
Sent: Wednesday, July 08, 2015 1:50 PM
To: Raives, James
Subject: the vegetation and biologic management program

1

Glyphosate was recently reclassified by the WHO as a "probable carcinogen". This reclassification with many other recent toxicologic published studies indicates that glyphosate vegetation application does indeed present a public health, ecosystem hazard. Studies showing persistence of the glyphosate formulations would require a posting of public warning signs for over a year post application. The migration of the pesticide in ground sprayed , also presents real problems for the public use of post sprayed areas. The effects of native flora and fauna are variable and some studies show alarming effects are added reasons to stop using glyphosate based herbicides.

Larry Rose M.D., M.P. H. retired public health medical director of Cal/OSHA for 30 years

RESPONSE TO COMMENT LETTER 24 - LARRY ROSE, JULY 8, 2015

Response to Comment 24-1

The commentor stated his concern with the use of glyphosate. This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. It is noted, however, that **Master Response 2 – Use of Glyphosate** discusses the major topics of concern in detail regarding glyphosate and its use within the draft VBMP as an environmental management tool.

Comment Letter 25

Raives, James

From: Linda Novy <lindanovy@comcast.net>
Sent: Wednesday, July 08, 2015 4:02 PM
To: Raives, James
Subject: Vegetation and Biodiversity Management Plan and Draft Tiered Program Environmental Impact Report

Dear James:

As a board member of the MCL, I am in total agreement with our letter to you dated today. However, as a private citizen I want to underscore several of the points the MCL letter makes and add my own comments.

25-01 1. Biodiversity should be emphasized strongly with ecosystem services noted in detail, as well as the risk to biodiversity loss through the increase of non-native invasive plants.

25-02 2. VBMP and TPEIR's relationship to the RTMP needs to be examined and integrated. Without that integration, the carrying capacity of the preserves cannot be well gauged.

25-03 3. I fully support the accounting of No Project Alternative of "doing nothing" – and how the impact of not managing invasive plants would impact our preserves. Also a study describing the alternatives to invasive plant management (labor and materials in hard costs) should herbicides be eliminated (Glyphosate in particular.)

25-04 4. I support adding Chaparral communities to the evaluation of impacts of fuel management; I do not support thinning of fuels in these plant communities. They are too valuable a resource to the watershed and wildlife to degrade through pruning which can lead to a loss of this plant community completely. Fire in these communities would spur regrowth and trigger dormant plant and seed growth.

25-05 5. In forests and woodlands, and encroaching into chaparral, the matter of fir tree management should be addressed. In clearing fuel breaks, closing trails, and thinning fuels, a priority should be placed on removing fir trees, which for decades, have not been managed through fire. With fir tree removal adequately addressed in th is DTPEIR it might better support the Department's work in the preserves in the public eye.

25-06 6. Lastly, I do support the use of an IPM program which includes the use of glyphosate.

Thank you for receiving my comments.

Sincerely,
Linda Novy
P O 969
Fairfax CA 94978

RESPONSE TO COMMENT LETTER 25 - LINDA NOVY, JULY 8,, 2015

Response to Comment 25-1

The concerns of the commentor regarding the risk of biodiversity loss as a result of infestation by non-native invasive species are noted. Please see **Master Response 8 - Biodiversity Issues**.

Response to Comment 25-2

The commentor stated that the VBMP's and TPEIR's relationship to the MCOSD *Road and Trail Management Plan* (RTMP) needs to be examined and integrated. The commentor is referred to page 74 of the Draft TPEIR where the relationship of the VBMP (and its EIR) to the adopted RTMP is discussed.

Response to Comment 25-3

Please see **Master Response 3 – Alternatives to Herbicide Use** for a discussion of alternatives and the herbicide-free approach. Refer to **Master Response 2 – Use of Glyphosate** for concerns regarding glyphosate.

Response to Comment 25-4

Chaparral is an important community type and habitat. It hosts many California endemic species and even some Marin endemic species. Fire is an important natural disturbance in chaparral vegetation and many areas of chaparral in the system of open space preserves have not burned in over 70 years. Returning fire as a natural disturbance is important. The MCOSD must weigh this management action with the potential for prescribed fires to escape and threaten lives and structures. The draft VMBP has many BMPs that are designed to minimize impacts to natural resources, such as chaparral, from fire hazard reduction work. **Section 5.1: Biological Resources** of the Draft TPEIR also details the potential impacts of fire hazard reduction strategies and the importance of the BMPs to reduce impacts to acceptably low levels.

Response to Comment 25-5

The concerns of the commentor over the effects of succession and spread of fir trees into other cover types are noted. The VBMP provides for the restoration and preservation of natural resources, including chaparral. To assist with management of resources on MCOSD land, the plan creates a vegetation zoning system. The plan identifies most chaparral as either Legacy or Sustainable Natural System Zones. The VBMP requires the MCOSD to provide the highest priority for protective management to vegetation in the Legacy Zone and requires protective management for vegetation in the Sustainable Natural Systems Zone, which will include addressing fir trees that encroach into other habitat types. Additionally, the process of habitat conversion, both from natural succession by native woody species and as a result of establishment and spread of invasive species, is not the result of some direct management practices of the District that would trigger CEQA review. There would be no potential impact to consider under CEQA related to this concern over habitat management, and no revisions to the Draft TPEIR are considered necessary in response to this comment. The potential impacts of implementing the VBMP on biological resources, including sensitive natural communities such as native grasslands, are fully discussed in **Section 5.1 Biological Resources** of the Draft TPEIR. Also please see **Master Response 9 - Grassland Habitat Management** where conversion of grasslands to woody cover is the focus of concerns.

Response to Comment 25-6

The commentor stated that she does not support the use of an IPM program that includes the use of glyphosate. This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. It is noted, however, that **Master Response 2 – Use of Glyphosate** discusses the major topics of concern in detail regarding glyphosate and its use within the draft VBMP as an environmental management tool.

Comment Letter 26

Raives, James

From: Mary Mac <mizmerrymac@yahoo.com>
Sent: Wednesday, July 08, 2015 12:46 PM
To: Raives, James
Subject: Public comment on Draft Marin Co Open Space District Vegetation Plan
Attachments: Glyphosate Bibliography.docx

Dear Mr. Raives,

I would like to submit the following comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report.

I am exceedingly unhappy with the fact that the Parks and Open Space District is proceeding with a vegetation management plan that includes the use of glyphosate and other herbicides.
The World Health Organization has labeled glyphosate a ‘probable carcinogen”. The Parks Dept. should not be spraying a probable carcinogen on public lands.

1

I would like to submit documents to be added to the Plan if possible. I would like them to be part of the official record. The first document that I want to submit is a bibliography of scientific studies and newspaper articles about glyphosate. This bibliography has approx. 95 entries. In this bibliography there are 21 articles alone about glyphosate in our soils, streams and air. We know that glyphosate persists in the soils, as a study done here in Marin for MMWD demonstrated. A USGS survey has even found glyphosate in the rain cycle in the Mississipi river basin. Can you imagine? Toxic pesticide raining on your head. Glyphosate was found by the USGS in 100% of the water samples tested. Knowing that glyphosate has contaminated water throughout the Mississippi River basin, why would it be used in Marin?

The second document that I want to submit are two peer reviewed studies on the use of glyphosate as the 'active ingredient' in a pesticide mix. I have added them as links below. Glyphosate must be mixed with other ingredients called adjuvants before use. These adjuvants are typically surfactants that allow glyphosate to stick to plants. A study of the complete mixture of glyphosate and its adjuvants has never been done by the EPA but in one of these linked studies, the pesticide mix is found to be 125 times more toxic than the active ingredient glyphosate. Can you justify using a chemical mixture that is 125 times more toxic than one that has been labeled a 'probable human carcinogen' by the World Health Organization?

https://d3n8a8pro7vhmx.cloudfront.net/yesmaam/pages/680/attachments/original/1407922513/Mesnage_et_al_2014_Major_Pesticides_are_more_toxic_to_human_cells_than_their_declared_active_principles.pdf?1407922513

26-01 continued

https://d3n8a8pro7vhmx.cloudfront.net/yesmaam/pages/680/attachments/original/1407922431/2012._Mesnage_et_al._Ethoxylated_adjuvants_of_glyphosate-based_herbicides_are_active_principles_of_human_cell_toxicity.pdf?1407922431

The third document that I would like added to the Plan is the report prepared by the Pesticide Action Network. Titled "A Generation in Jeopardy", it details the health consequences of pesticide use to our children. Our children are sick and getting sicker. Cancer has become the #2 killer of children. Can you really justify using a 'probable human carcinogen' on public spaces that are used by children and their families?

http://www.pesticidereform.org/downloads/Children_s%20Health%20and%20Pesticides.pdf

I urge you to amend the Plan to eliminate the use of glyphosate. The City of Richmond has placed a moratorium on its use. The countries of Sri Lanka and El Salvador, suffering from high rates of kidney disease and death, have banned its use. The Netherlands has banned all non-commercial use and many other countries are reviewing it. Please show the leadership that Marin County is known for and eliminate the use of glyphosate from the Plan.

Sincerely,

Mary Fraser

110 Seminary Drive, Apt. 2A, Mill Valley, CA 94941

415 686-8072

RESPONSE TO COMMENT LETTER 26 - MARY FRASER, JULY 8, 2015

Response to Comment 26-1

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate toxicity, safety, environmental fate, and the WHO's conclusions regarding glyphosate. Refer to **Master Response 4 – Adjuvants and Inert Ingredients** for discussion on adjuvants, inert ingredients, and cumulative impacts of herbicide formulations.

Comment Letter 27

Raives, James

From: Mary Mac <mizmerrymac@yahoo.com>
Sent: Wednesday, July 08, 2015 3:13 PM
To: Raives, James
Subject: Comment on Marin County Open Space District Vegetation Plan

Dear Mr. Raives,

27-01

I would like to submit the following comment on the Draft Marin County Open Space District Vegetation and Biodiversity Management Plan and the Draft Marin County Open Space District Vegetation Plan. I have personally compiled the following list and I am requesting that it be added to the official comments.

School Districts, Cities & Towns, Park Districts, Counties, States and Countries where the use of glyphosate and/or pesticides is restricted or banned.

Marin Municipal Water District, Marin County, CA. 22,000 acres of watershed- Pesticides banned. Vote taken 7/7/15

City of Fairfax, CA- Pesticides banned on commons.

City of Belvedere, CA- Pesticides banned on commons.

Reed School District, Tiburon, CA- Pesticides not used on school district grounds.

Larkspur-Corte Madera School District, Corte Madera, CA-Pesticides not used on school grounds.

Mill Valley School District, Mill Valley, CA- Pesticides not used on school grounds.

City of Richmond, CA- Moratorium on organophosphate pesticides

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Country of the Netherlands- Glyphosate banned for non-commercial use. http://sustainablepulse.com/2014/04/04/dutch-parliament-bans-glyphosate-herbicides-non-commercial-use/#.VZ2Wca5Vikp

Country of Sri Lanka-Glyphosate banned http://www.publicintegrity.org/2014/03/13/14418/sri-lanka-bans-monsanto-herbicide-citing-potential-link-deadly-kidney-disease.

County of El Salvador- Glyphosate banned by legislature.

Country of Bermuda- Glyphosate imports suspended. http://www.todayinbermuda.com/news/health/item/1471-health-minister-importation-of-roundup-weed-spray-suspended

27-01 (cont.)

Country of Brazil. Chief prosecutor wants glyphosate banned. http://www.globalresearch.ca/brazils-public-prosecutor-wants-to-ban-monsantos-chemicals-following-recent-glyphosate-cancer-link/5449440

Country of Germany and the European Union (EU). EU ban proposed by ministers. http://www.globalresearch.ca/german-ministers-call-for-eu-wide-ban-on-monsantos-deadly-glyphosate-herbicide-roundup/5451831

Country of Argentina. 30,000 medical doctors call for ban on glyphosate. http://www.globalresearch.ca/30000-doctors-in-argentina-demand-that-glyphosate-be-banned/5445542

1. Country of Columbia. Glyphosate banned for use on illicit crops. http://www.bbc.com/news/world-latin-america-32677411

-

Country of France. Sale of glyphosate banned. http://www.naturalnews.com/050248_french_legislation_glyphosate_ban_Monsanto_GMOs.html

Sincerely,
Mary Fraser
110 Seminary Drive, Apt. 2A
Mill Valley, CA 94941
415 686-8072

Attachment to Comment Letter 27

EFFECTS OF GLYPHOSATE BIBLIOGRAPHY

1. Antoniou, M.et.al. Teratogenic Effects of Glyphosate-Based Herbicides Environmental & Analytical Toxicology, J. Environ Anal Toxicol. 2012.Jun 23, 2012 - Environmental & Analytical. Toxicology. Antoniou et al., J Environ Anal Toxicol 2012, S:4 http://dx.doi.org/10.4172/2161-0525.S4-006. (on birth defects)

2. Aris, A., & Leblanc, S. (2011). Maternal and fetal exposure to pesticides associated to genetically modified foods in Eastern Townships of Quebec, Canada. Reproductive Toxicology, 31(4), 528-533. (on presence of glyphosate and Bt insecticidal proteins in pregnant women and cord blood)

3. Barberis, C. L., Carranza, C. S., Chiacchiera, S. M., & Magnoli, C. E. (2013). Influence of herbicide glyphosate on growth and aflatoxin B1 production by Aspergillus section Flavi strains isolated from soil on in vitro assay. Journal of Environmental Science and Health, Part B, 48(12), 1070-1079. (on toxic fungi appearing in soil sprayed with glyphosate)

4. Barrett, Mike Monsanto's Infertility-Linked Roundup Found in All Urine Samples Tested. Mike Barrett, Natural Society. 1/26/2012. (a news article following the Ithaka journal study of glyphosate in German urine)

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RESPONSE TO COMMENT LETTER 27 - MARY FRASER, JULY 8, 2015 (SECOND LETTER)

Response to Comment 27-1

Please refer to **Master Response 2 – Use of Glyphosate** and Response to Comment 4-85.

Comment Letter 28

Raives, James

From: Mary Osterloh <mariejesuis@gmail.com>
Sent: Wednesday, July 08, 2015 5:16 PM
To: Raives, James
Subject: Public comment

28-01

Invasive species or toxins? I pick invasive species!

Deciding to use Glyphosate (roundup) in weed management on our watershed is a mistake. It is harmful to human health and the ecosystem.

Aside from the research on glyphosate harm to humans, please consider the chemical cocktail in applying chemicals in general. How will it intersect for instance with chemical applications from the Meadow Club?

If you just irradiate, employ people to disk and weed, and enhance the local economy.

Sincerely,
Mary Osterloh

from me, my phone, and I.

RESPONSE TO COMMENT LETTER 28 - MARY OSTERIOH, JULY 8, 2015

Response to Comment 28-1

The commentor stated that she does not support the use of glyphosate. This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. It is noted, however, that **Master Response 2 – Use of Glyphosate** discusses the major topics of concern in detail regarding glyphosate and its use within the draft VBMP as an environmental management tool.

Comment Letter 29

Raives, James

From: Mary Osterloh <mariejesuis@gmail.com>
Sent: Wednesday, July 08, 2015 5:17 PM
To: Raives, James
Subject: Fwd: Public comment

29-01 Typo. Para 4 should read:
"If you need to eradicate...."

from me, my phone, and I.

Begin forwarded message:

From: Mary Osterloh <mariejesuis@gmail.com>
Date: July 8, 2015 at 5:15:50 PM PDT
To: "JRaives@marincounty.org" <JRaives@marincounty.org>
Subject: Public comment

Invasive species or toxins? I pick invasive species!

Deciding to use Glyphosate (roundup) in weed management on our watershed is a mistake. It is harmful to human health and the ecosystem.

Aside from the research on glyphosate harm to humans, please consider the chemical cocktail in applying chemicals in general. How will it intersect for instance with chemical applications from the Meadow Club?

If you just irradiate, employ people to disk and weed, and enhance the local economy.

Sincerely,
Mary Osterloh

from me, my phone, and I.

RESPONSE TO COMMENT LETTER 29 - MARY OSTERIOH, JULY 8, 2015 (SECOND LETTER)

Response to Comment 29-1

Comment noted. This is a correction to a previous comment letter (see comment letter 28) from the commentor.

Comment Letter 30

TO: Marin County Open Space District, James Raives

Marin County Supervisors Katie Rice, Kate Sears, Steve Kinsey, Judy Arnold, Damon Connolly

FROM: Mimi Willard, Kentfield

DATE: July 8, 2015

RE: **Comment re draft Tiered Program Environmental Impact Report (Draft TPEIR) for the Vegetation and Biodiversity Management Plan (VBMP)**

I am writing to urge Marin County Open Space District, and its governing body, the Marin County Board of Supervisors, to reject the use of herbicides proposed in the VBMP TPEIR currently being circulated for public comment.

30-01

The draft TPEIR has been effectively outdated (and invalidated) by two recent events. These developments should prompt MCOSD and BoS to prohibit herbicides on public lands under their purview. Failing that, a new draft TPEIR should be required, which is costly and time-consuming; an interim moratorium on the application of herbicides would be appropriate pending the completion of a new draft TPEIR.

The first material development was the March 20, 2015 issuance of a Monograph by the World Health Organization's International Agency on Research for Cancer concluding that glyphosates are probably carcinogenic to humans. However, neither the Marin County Parks and Open Space District's April 2015 Vegetation Management Plan nor its April 2015 draft TPEIR discloses or discusses this very important material development that would be of concern to the public. Failure to even mention the WHO's action constitutes a fundamental flaw in the public disclosure and comment solicitation process.

In a second, related development, on July 7, 2015, the Marin Municipal Water District Board of Directors voted to remove herbicides from consideration in its vegetation management. The June 19, 2015 MMWD staff report advocating this action cites the WHO document as a key reason for its recommended policy change, stating:

> "Recently, the World Health Organization's International Agency for Research on Cancer {IARC} classified glyphosate as a probable human carcinogen (Guyton et al 2015) which has increased public apprehension regarding exposure to this and other herbicides."

Marin County Parks and Open Space District April 2015 VBMP depends to a large degree on MMWD's research and policies to justify its proposed herbicide use. As stated on page 3-19 of the April VBMP:

> "The MCOSD has partnered with MMWD and funded part of this research, and it has stated its intention to incorporate MMWD's findings to the full extent feasible and to build upon the extensive knowledge base that MMWD has created."

Given MCOSD's avowal that it will follow MMWD's lead and depend on the latter's (superior) knowledge base, and given MMWD's subsequent unequivocal rejection of herbicide use in the watershed, MCOSD clearly should follow suit.

The draft TPEIR is fatally flawed by a material omission as well as its dependence on the research and knowledge of MMWD, which now says "no" to herbicides.

It is incumbent on the Board of Supervisors to heed both the science and the public will. Join MMWD in saying "no" to herbicides in the county's parks and open spaces.

For the text of the WHO report cited above:

http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf

For the text of the MMWD staff report cited above:

http://www.marinwater.org/AgendaCenter/ViewFile/Agenda/07072015-278

RESPONSE TO COMMENT LETTER 30 - MIMI WILLARD, JULY 8, 2015

Response to Comment 30-1

The commentor states that the Draft TPEIR is outdated and invalidated due to two recent events - the issuance of a monograph by the World Health Organization's International Agency on Research for Cancer and a vote by the Marin Municipal Water District (MMWD) Board of Directors, on July 7, 2015, to remove herbicides from consideration in its vegetation management. **Master Response 2 - Use of Glyphosate** considers the recent glyphosate evaluation by the Institute for Research on Cancer (IARC) which classified glyphosate as a probable human carcinogen plus risk assessments prepared by the Marin Municipal Water District. The availability of this information does not outdate or invalidate the TPEIR.

Comment Letter 31

Raives, James

From: Sidney Dent <mouselib@prodigy.net>
Sent: Wednesday, July 08, 2015 12:27 PM
To: Raives, James
Subject: My public comment on Draft Marin County Open space Veg and Biodiverstiy plan.

31-01

Sir, I am have lived in this county for 25 years and enjoy frequent hiking in the parks and open space.
I find it disturbing that you are planning to continue using herbicides and pesticides on the area.
There are organic methods to control vegetation and prefer that you use such in this county.
I have heard of manual pulling of weeds using either volunteers or pain labor.
I'm sure you will be hearing of alternatives from speakers at your public comment and hope you take notes. Thank you Susan Sidney Dent
115 Woodland Avenue, San Rafael Ca 94901

RESPONSE TO COMMENT LETTER 31 - SIDNEY DENT, JULY 8, 2015

Response to Comment 31-1

This comment is on the merits of the proposed VBMP, and not the adequacy of the Draft TPEIR. Please see **Master Response 2 - Use of Glyphosate**. Master Response 2 considers the recent glyphosate evaluation by the Institute for Research on Cancer (IARC) that classified glyphosate as a probable human carcinogen plus risk assessments prepared by the Marin Municipal Water District.

Comment Letter 32

From: William Rothman, MD
Attention: James Raives, Department of Parks and Open Space, County of Marin
Please acknowledge receipt of this 11 page, 20 issue, compilation of comments on the Draft EIR

Submissions for preparation of Final EIR for the Vegetation and Biodiversity Management Plan, showing absence or inadequacy of consideration, in the Draft EIR for the Vegetation and Biodiversity Management Plan (Draft Tiered Program Environmental Impact Report).

Submission Issue 1:
1 For the reasons outlined below, I feel it vitally important that the possible interactive environmental, vegetation, animal and human health effects, (especially with respect to skin absorption when the public touch sprayed vegetation), of the chemicals contemplated for use, and listed on page 247, which could come in contact, in use, with each other, with consequent environmental and human health effects, be considered in the draft EIR.

Reasons for considering interactive effects:
It is well known that the environmental, vegetation, animal and human health effects of many chemicals, including all of those listed on page 247, are increased or decreased by the presence and use of other chemicals, as would be the case with the large number of herbicidal chemicals and chemical mixtures proposed for possible use in the Plan and the draft EIR

As is obvious, the total number of the various possible combinations of the chemicals listed total more than the square of the number of chemicals listed, which is to say, more than 64 possible combinations (each of which might well have different environmental, vegetation, animal and human health effects), but actually more than that, because in many instances, such as concerning the so-called "inerts" included in the mixtures in which the listed active ingredients are included, there are more than single such so-called "inerts"

The draft EIR is, for its absence of consideration of such effects, defective. For the reasons outlined above, I feel that the Final EIR must, if its environmental, vegetation, animal and human health effects are to be considered valid, include the environmental, vegetation, animal and human health effects of mixtures of any and all of the chemicals listed on page 247 which might, in use, come in contact with each other.

I feel that these vital evaluations should be required to be included in the Final EIR.

Submission issue 2:
The Draft EIR is deficient in that it failed to reflect the obvious human health effect, (especially with respect to skin absorption when the public touch sprayed vegetation) **Glyphosate Cancer Causation**. **The United Nations' World Health Organization** has determined (WHO report, March
2 20, 2015) that there is sufficient research evidence to classify Glyphosate as being a probably carcinogen. The WHO evaluated-research involved human cellular Chromosome and DNA damage that is associated with cancer causation. Because people, especially pregnant women and children, use the Open Space land, this revealed cancer danger associated with Glyphosate must surely preclude the use of glyphosate. These toxicity findings, combined with the fact, as shown in submission 11, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

The draft EIR is deficient because it does not take these environment-impacting, and health-impacting facts into account.

Submission issue 3:
The draft EIR is inadequate in that it fails to list the names of surfactant chemicals that would be used. Different surfactants have, themselves, different toxicologic health effects (especially with respect to skin absorption when the public touch sprayed vegetation) and environmental effects, and when different surfactants, (for instance, Competitor vs. POEA used with glyphosate) used, as they are with herbicidal active ingredients, different toxicological health effects and environmental effects result.
3 For this reason if the Final EIR is to be considered complete, it must contain information about surfactants that might be used, how they would interact with the other chemicals to be used, and how this could effect human health and the environment.

This, combined with the fact, as shown in other of my submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

Submission issue 4: The Draft EIR. for the Vegetation and Biodiversity Management Plan contains (especially with respect to skin absorption when the public touch sprayed vegetation), the following defect:
Page 379 shows that reliance in formulating the report was placed upon the content of the MMWD 2012 WPHIP. You will note, on page 10 of that MMWD WPHIP, that it relied upon, as is shown on
4 page 10, the background report #3, titled Herbicide Risk Assessment, prepared by PRI (Pesticide Research Institute) and included in Marin Municipal Water District Vegetation Management Plan DRAFT-1/1/2010 Herbicide Risk Assessment Chapter 3 Glyphosate,

Unfortunately, that report contained the risk assessment defects (especially related to skin absorption) shown below, and since the draft Vegetation and Biodiversity Management Plan, and its accompanying draft EIR itself, relies upon that faulty information, those aspects of the draft EIR must be re-evaluated for the final Open Space EIR.

Defects found in MMWD Herbicide Risk Assessment, with relation to glyphosate, which, as is reflected in the bibliography for the Open Space Draft EIR, were relied upon for development of the Open Space Draft EIR (References referred to are in that Risk Assessment Background Report of that MMWD document shown in the Bibliography: (Each of the defects noted, below, to have derived from the use of that MMWD-referenced document are identified, below, by the letters “mmwd”, in parentheses, appearing before the words “With respect to Reference”, and all such listed reference numbers refer to their numbers in the MMWD document upon which the Open Space Draft EIR has placed reliance for its own conclusions”

(mmwd)With respect to Reference 60:
Defects in considering findings in **<u>Reference 60</u>** (Glyphosate Skin Binding, Absorption, Residual Tissue Distribution. Ronald C Wester, et al. U.C.S.F. Fundamental and Applied Toxicology, Vol 16 725-732 (1991), to be relevant to MMWD using glyphosate/competitor mixture, a per toxicology discussed in DRAFT1/1/2010 Herbicide Risk Assessment (This is the only risk assessment report that has been done)

Section 3.2.2 of mmwd glyphosate safety report page 3-15 title of section “Routes of Exposure”

1) Human skin absorption study used cadaver skin, from people dead for up to 5 days, not living skin, as would be true for MMWD use.

2) Human skin absorption study used a different surfactant than Competitor, the surfactant that would be used by MMWD.

32-04 continued

3) Rhesus Monkey absorption study used a different surfactant than Competitor, the surfactant that MMWD would use.

4) Rhesus Monkey study involved washing the glyphosate off with soap and water within 12 hours of exposure to Roundup (Glyphosate + POEA surfactant).

(mmwd) With Respect to Reference 61

Defects in considering findings in **Reference 61** (In Vitro Percutaneous Absorption of Model Compounds Glyphosate and Malathion from Cotton Fabric into and through Human Skin. R.C. Wester et al U.C.S.F. Food and Chemical Toxicology vol 34 1996. 731-735) to be relevant to MMWD using glyphosate/competitor mixture, a per toxicology discussed in DRAFT1/1/2010 Herbicide Risk Assessment (This is the only risk assessment report that has been done)

Section 3.2.2 of mmwd glyphosate safety report page 3-15 title of section "Routes of Exposure"

1) The study involved cadaver skin, not skin of living people, which is different from MMWD proposed use of glyphosate where people coming into contact with glyphosate would be alive.

2) The glyphosate was not mixed with any surfactant, thereby making the situation different than MMWD proposal, where surfactant would be used and would increase absorption.

3) Very significant is the fact that when the sheets on which the glyphosate had been permitted to dry were re-moistened absorption of glyphosate was increased 360%.

(mmwd) With respect to Ref 69

NIOSH:In 2001, NIOSH sponsored a study investigating take-home pesticide exposure in farm and non-farm families in Iowa.

Curwin BD, Hein MJ, Sanderson WT, et al. 2007. Urinary pesticide concentrations among children, mothers and fathers living in farm and non-farm households in Iowa. Ann Occ Hyg 51(1): 53-65.

Defects in considering Ref 69 as being considered applicable to proposed MMWD use of glyphosate

1) To be included, test subjects need only have been exposed to any one of 6 different pesticides. Obviously, for comparison with MMWD situation, Glyphosate studies done on non exposed test subjects needed to be thrown out, but averages of all studies were used.

2) The surfactant used was of a different class and mechanism of action than that proposed by MMWD, so differences in glyphosate skin absorption are to be expected compared to Ref 69 findings.

3) All farmers in study knew they were using glyphosate mixtures, so may be assumed to have worn protective clothing, and subsequent to spraying washed skin to prevent skin exposure to glyphosate. Hikers, people picnicking, children, etc. using MMWD for recreation would not have such protection from rubbing against sprayed vegetation for the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations.

32-04 continued

(mmwd) With Respect To Ref 70

70Curwin BD, Hein MJ, Sanderson WT, et al. 2007. Pesticide dose estimates for children of Iowa farmers and non-farmers. Environ Res105(3): 307-315.

Defects in considering Ref 70 as being applicable to proposed use of glyphosate

1) Ref 70 study involved a different surfactant, with a different mechanism of action, than that proposed by MMWD, so differences in glyphosate skin absorption are to be expected compared to Ref 70 findings.

2) All farmers in study knew they were using glyphosate mixtures, so also wore protective clothing, and subsequent to spraying washed skin to prevent skin exposure to glyphosate. Hikers, people picnicking, children, etc. using MMWD for recreation would not have such protection from rubbing against sprayed vegetation for the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations.

(mmwd) With Respect to Ref 71

Finland:

In Finland, five forestry workers and five controls were monitored for urinary glyphosate levels before, during and after clearing trees using brush saws equipped with pressurized sprayers. All samples were below the limit of detection (LOD) of 0.1 ng/µL

Ref 71: Jauhiainen A, Rasanen K, Sarantila R, et al. 1991. Occupational exposure of forest workers toglyphosate during brush saw spraying work. Am Ind Hyg Assoc J52(2): 61-64.

Defects in considering reference 71 findings as being applicable to proposed MMWD use of glyphosate

1) All workers using glyphosate wore protective clothing, and subsequent to spraying washed skin to prevent skin exposure to glyphosate. Hikers, people picnicking, children, etc. using MMWD for recreation would not have such protection from rubbing against sprayed vegetation for the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations.

2) This study was done in 1991, and involved a different surfactant, with a different mechanism of action, than that proposed by MMWD, so differences in glyphosate skin absorption are to be expected compared to Ref 71 findings

(mmwd) With Respect to Ref 72

Arkansas:

Total urine excreted over a 12 week period was collected and tested for glyphosate in

workers employed as applicators, weeders, and scouts at two tree nurseries in Arkansas.

Lavy TL, Cowell JE, Steinmetz JR, et al. 1992. Conifer seedling nursery worker exposure to glyphosate. Arch Environ Contam Tox 22: 6-13

32-04 continued

Defects in considering reference 72 findings as being applicable to proposed MMWD use of glyphosate

1) Applicators wore heavy protective clothing. Others who had contact were instructed to wash well. Hikers, people picnicking, children, etc. using MMWD for recreation would not have such protection from rubbing against sprayed vegetation for the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations

2) This study was done in 1991, and involved a different surfactant, with a different mechanism of action than the surfactant proposed for use by MMWD, so differences in glyphosate skin absorption are to be expected compared to Ref 72 findings.

(mmwd) With respect to ref 73

Ref 73 Forestry: Urinary glyphosate levels were measured in 15 forestry workers, the day prior to, the day of and three days following application of the original Roundup.

Defects in considering reference 73 findings as being applicable to proposed MMWD use of glyphosate

1) The participants in Ref 73 wore protective clothing and equipment, hikers, people picnicking, childen, etc. using MMWD for recreation would not have such protection from rubbing against sprayed vegetation for the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations.

2) This study involved a different surfactant, with a different mechanism of action, than that of the surfactant proposed by MMWD, so differences in glyphosate skin absorption are to be expected in MMWD watershed contacts compared to Ref 73 findings.

(mmwd) With Respect to Refs 74 and 75

Farm Family Exposure Study (FFES):

The Farm Family Exposure Study is a biomonitoring study of 45 farm families in Minnesota and 50 families in South Carolina, conducted by the University of Minnesota and co-sponsored by CropLife America, a trade association for agricultural chemical companies (Bayer, Dow, DuPont, FMC, Monsanto, and Syngenta) and the American Chemistry Council.

(mmwd) Ref s 74 and 75

Farm Family Exposure Study (FFES):

The Farm Family Exposure Study is a biomonitoring study of 45 farm families in Minnesota and 50 families in South Carolina, conducted by the University of Minnesota and co-sponsored by CropLife America, a trade association for agricultural chemical companies (Bayer, Dow, DuPont, FMC, Monsanto, and Syngenta) and the American Chemistry Council.

Defects in considering results shown in References 74 and 75 as applicable to MMWD's proposed use of Glyhosate:

1) Ref 74 and 75 pesticide industry studies, failed to distinguish between degrees of protection used by participants (closed or open tractor driving compartments, gloves, type of clothing, etc), but averaged results. None of the hikers, people picnicking, children, etc. using MMWD for recreation would be expected to have

such protection when rubbing against sprayed vegetation during the more than 3 months after spraying, that MMWD research showed glyphosate, when used with proposed surfactant, to persist in large concentrations.

32-04 (cont.)

2) Refs 74 and 75 study involved a different surfactant, with a different mechanism of action, than that of the surfactant proposed by MMWD, so differences in glyphosate skin absorption are to be expected in MMWD watershed contacts compared to findings found in Refs 74 and 75.

Submission issue 5**:**

The Draft EIR is deficient in that it contains no Surfactant risk assessment (especially with respect to skin absorption when the public touch sprayed vegetation) with respect to surfactants to be used, and is also deficient because the risk environmental impact risk evaluation of such surfactants cannot be evaluated, since no surfactants are named. The draft EIR is, therefore, deficient in failing to evaluate the environmental detrimental effects that could result from the use of such surfactant chemical, themselves, or other detrimental effect that could result from their being applied mixed, as they would be, with active herbicidal chemicals. For the reasons outlined below, it is absolutely necessary that in finalizing the EIR, the services of a Medical Toxicology consultant be employed to take into consideration the described-below deficiency in the existing risk assessment of the contemplated use of the surfactants being considered. This recommendation is supported by the fact that MMWD, the reports of which organization are referenced in this draft EIR, in its own WPHIP draft EIR, which has been used as a source for the Open Space draft EIR, has employed the services of such a consultant to evaluate human health environmental effects of the chemicals contemplated for use

32-05

As you are probably aware, as described in the U.S. Department of Agriculture "**Analysis of Issues Surrounding the Use of Spray Adjuvants With Herbicides (**David Bakke, Pacific Southwest Regional Pesticide Use Specialist December 2002 Revised, January 2007),

"Surfactants are a group of Adjuvants that are mixed with an herbicide solution to improve performance of the spray mixture. Adjuvants can either enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application, such as adverse water quality or wind (special purpose or utility modifiers). **Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants.** This paper deals mainly with commonly used activator adjuvants used in herbicide applications in forestry. Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants."

Numerous research articles have shown that dermal absorption of many chemicals is enhanced by mixing such chemicals with the same surfactant constituents that are present in the surfactant agents contemplated mixture, by MMWD, with the pesticides contemplated for use. In fact, many dermally applied medications are intentionally mixed with surfactants, specifically to enhance their absorption in the body.

The deficiency in the Open Space risk assessment of the use of the surfactants contemplated for use rests in the fact that no research is presented concerning the degree to which the surfactants contemplated for use in herbicide/surfactant mixtures would increase the skin absorption and, thereby the toxicity of the herbicides with which they would be mixed.

It is very important to note that there has been no skin absorption testing, whatsoever, for the degree to which the skin absorption glyphosate will be enhanced by Liberate, the surfactant currently used by Parks and Open Space, or Competitor, also a nonionic surfactant, which is also used mixed with glyphosate. The draft EIR is defective in failing to evaluate the negative potential effects of skin absorption of glyphosate which could result from its use with this class of surfactants.

32-06

This issue is of particular concern because MMWD's own U.C. Davis study revealed that, when a mixture consisting of glyphosate and the surfactant planned for use was applied to vegetation, it remained at full strength on such vegetation for more than 3 months. In that circumstance people, including pregnant women

32-06 (cont.)

and small children, groups particularly sensitive to the toxicity of herbicides, would, while walking through such vegetation, obviously be subject to getting the mixtures on their skin.

Submission issue 6:

32-7 The draft EIR is defective in that it completely fails to consider the environmental effects of the degree to which various native desirable vegetation would, in light of the known effect of Glyphosate on the Shikimate pathway, upon which soil bacteria (the vital soil microbiome) and plant vegetation are dependent, be impacted, especially in light of MMWD's research on Glyphosate persistence (full concentration persisting for more than 3 months) if a Glyphosate/surfactant mixture were, as is contemplated, be employed by Parks and Open Space.

I am making this request, at this time, because I am unable to locate, in the draft EIR, any recognition of Glyphoste's known impact on the Shikimate pathway, and what resulting detrimental environmental effects on non-target native vegetation species would derive therefrom.

Submission issue 7

Area of Input: Biological Control of French Broom
The draft EIR is deficient in failing to consider the possible environmental benefits of applying the biological controls described below to managing weeds, especially invasive broom.

32-8

There has been a significant amount of research, and there continues to be additional research, regarding control of French broom by the following organism: Order: Hemiptera. Family: Psyllidae. Species: *Arytinnis hakani* **...** Also designated: The French broom psyllid.

The results of this ongoing research was not available in 2008, at the time of the workshop and status report titled "Marin Municipal Water District Vegetation Management Plan Update (dated June, 2008)" . That is referenced in this communication, because that MMWD report is referenced as a source for the Vegetation and Biodiversity Management Plan /Draft Tiered Program Environmental Impact Report.

To achieve environmental completeness in this regard, the Vegetation and Biodiversity Management Plan (Draft Tiered Program Environmental Impact Report) must, I believe, include evaluation of several of the research studies, both those in Europe, and those in the United States, that have been done on this organism which eats French Broom.

Also, in Australia, the Australian government, in the course of considering the ability of arytinnis hakani to destroy French broom, the same broom that is an Open Space major problem, and which is naturally controlled by arytinnis hakani in the Mediterranean area, found that arytinnis hakani had already arrived, naturally, in Australia, in some areas of its broom problem, and that the organism was well on its way, in such areas, to controlling broom without needing pesticides.

When this became apparent, the Australian government shifted its policy on French broom control to prominently include a program to transfer arytinnis hakani from areas where it had already arrived, and was controlling broom, to other areas not yet inhabited by arytinnis hakani. That program is showing great success.

For this reason, I feel that the draft EIR is deficient in that it does not consider the role that such a natural predator of broom could play, and thereby potentially decrease the risks of pesticides which are known and are described in the draft EIR. Also, since it is not known whether arytinnis hakani has yet arrived in Open Space areas, the EIR, to be considered complete, must definitely include an evaluation of to what degree, if any, arytinnis hakani may already be present in the lands under the purview of parks and Open Space .

Submission: Issue 8

The draft EIR is deficient in that it fails to consider the environmental-effects benefits that could result from bio control of Scotch Broom (in addition to French Broom issues noted in Submission issue 7) from newly arrived, natural occurring effects of the Gall Mite, Aceria Ginistae.

32-9

Recent evaluations by the U.S. Forestry Service, the California Department of Food and Agriculture and the University of California Extension Service, brought to my attention by the CDFA Primary Plant Biologist, Doctor Kean, have revealed that the Gall Mite, Aceria Ginistrae, a natural eater of Scotch Broom, in the lands of Scotch Broom's origin, has migrated to the West Coast of the United States, including California, and is already having a marked effect in California, in the control of Scotch Broom.

Because Scotch Broom is a major component of the invasive weeds in the Open Space, I feel that it is absolutely necessary that an entomological survey of the Open Space be performed to determine the degree to which our Scotch Broom may have already become infested with Aceria Ginistae. And also to evaluate the potential for that organism to serve, instead of toxic pesticides, for the control of Open Space Scotch Broom.

Now that Aceria Ginistae is known to be present in our area, and since it has proven so effective in the control of Scotch Broom, it is obviously necessary that the full potential of that role be taken into account in the Draft EIR, especially because the presence of Aceria Ginistae, as a natural eater of Scotch Broom would decrease the environmental harms and toxic human effects of the pesticides listed for use in the draft EiR, the risks of which are known and/or described in the draft EIR

Submission issue 9**:**

The Draft EIR is deficient in that it fails to take into account CDFA information and USDA (ARS) bio-control information (see submission 8) that makes it imperative that, in going forward to the final EIR, the use of a highly qualified entomologist be employed for evaluation of potential already-here and/or very-soon-to-be-here insect control of Parks and Open Space Broom and other invasives.

32-10

In this regard, please find, below, for your reference, information of self-evident importance, available from scientists at the California Department of Agriculture and Scientists at the United States Department of Agriculture:

The information, below, shows, that the following organisms, several of which have been found in California, and all of which are known to eat broom and other undesirable vegetation are already present in California, and may well already be eating broom in the watershed or may be expected to control the broom and other undesirable vegetation in the near future. Their potential role must, necessarily, become part of the Draft EIR evaluation. Clearly, in light of the scientific information, presented below, from scientists at the CDFA and the USDA, no EIR could possibly be considered complete without the requested evaluation.

psyllid, A. hakani

The seed pod weevil, Exapion fuscirostre

The stem-boring moth, Leucoptera spartifoliella

The psyllid, Arytainilla spartiophila

Asphondylia pilosa

The gall mite, Aceria genistae

The psyllid, Arytaina genistae

The seed beetle, Bruchidius villosus

<u>Submission Issue 10</u>

32-11 The Draft EIR is deficient in that it (especially with respect to skin absorption when the public touch sprayed vegetation) failed to provide the following information concerning Glyphosate persistence after it is applied. Glyphosate is categorized by The U.S. EPA as *"extremely persistent",* lasting up to 6 months. (U.S. EPA, Division of ecological effects, 1993. And Monsantos' own Material Safety Data Sheet).,

And very important: A 2010, U.C. Davis study, commissioned by our own Marin Municipal Water District, revealed that Glyphosate, when applied to vegetation, remains at <u>full strength concentration</u> for at least 3 months, at which time testing ended. (full text of research report available from MMWD. Graph showing 88 day full strength persistence is available from MMWD.

Who, especially pregnant women, or those accompanied by small children, would willingly picnic on, or walk through pesticide-laden vegetation?

The draft EIR must obviously be adjusted to take into account (especially related to skin absorption) these research-revealed findings.

<u>Submission Issue 11</u>

32-12 The Draft EIR is deficient in that it failed to reflect (especially with respect to skin absorption when the public touch sprayed vegetation)the following research findings:

Glyphosate increases miscarriages, due to placental damage. (Negative impact on placental aromatase) (David Savitz, M.D. Am. Jnl. Of Epidemiology, vol. 146, 1997, and T.E. Arbuckle, Environmental Health Perspectives, vol. 109, 2001). and (Seralini et al. Environmental Health Perspectives. June 2005). These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

<u>Submission Issue 12</u>

32-13 The Draft EIR is deficient in that it failed to reflect the following research findings (especially related to skin absorption):

Decreased testosterone production (L. Walsh, Ph.D., Environ Health Perspectives. Vol. 108, 2000) (M.I. Yousef, Ph.D. NIH, 1992) These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

<u>Submission Issue 13</u>

32-14 The Draft EIR is deficient in that it failed to reflect (especially with respect to skin absorption when the public touch sprayed vegetation) the following research findings:

Abnormal fetal development (Julie Marc, Ph.D. Jnl of the American Chemical Society vol. 15. 2002)

32-14 (cont.)

These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

<u>Submission Issue 14</u>

The Draft EIR is deficient in that it failed to reflect (especially with respect to skin absorption when the public touch sprayed vegetation) the following research findings:

32-15 **Promotion of Breast Cancer cell growth** (Food Chemical Toxicology. June 8, 2013)

These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

32-16

<u>Submission Issue 15</u>

The Draft EIR is deficient in that it failed to reflect the following research findings:

Glyphosate spraying will increase the risk of <u>West Nile Virus</u>. Research has shown it kills tadpoles and frogs. Since those amphibians eat mosquito larvae, use of Glyphosate, due its harm to those amphibians, will significantly increases the risk of West Nile Virus. (Richard A. Relyea, PhD. Ecological Applications, vol. 15, No. 2, 2005).

<u>Submission Issue 16</u>

The Draft EIR is deficient in that it failed to reflect the following research findings, and their consequences for human health (especially with respect to skin absorption when the public touch sprayed vegetation), shown below:

Glyphosate interferes with the liver's cytochrome P450 oxidase enzyme system, which controls levels of hormones, including estrogen and testosterone. Excess estrogen is known to promote breast cancer, and excess testosterone stimulates prostate cancer (Ref: E. Hietanen, Ph.D. Acta Pharmacol. et Toxicol. 1983, vol. 53).

32-17 Furthermore, that same Enzyme also effects the blood levels and toxicities of many medications, and thereby glyphosate can interfere with achieving proper levels of medications used for: **<u>Cancer (Chemotherapeutic Medications)</u>**, **<u>Heart failure and Blood Pressure,</u>** **<u>High Cholesterol,</u>** **<u>Infections,</u>** **<u>Blood Clots</u>**. **<u>Psychiatric conditions</u>**, **<u>AIDS</u>** and **<u>Diabetes.</u>** (Role of cytochrome P450 enzymes in regulating metabolism of medications used in each of the listed illnesses is included in the cautions, for each such medication, deliniated in the Physicians Desk Reference. These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

32-18

<u>Submission Issue 17</u>

The Draft EIR is deficient in that it failed (especially with respect to skin absorption when the public touch sprayed vegetation) to reflect the following research findings:

Glyphosate interferes with <u>intestinal</u> Cytochrome P450 oxidase, which controls the absorption of many medications. This can lead to toxic blood levels of such drugs. (European Journal of Pharmaceutical Sciences 2000 Nov;12(1):3-12. And: *Entropy* **2013**, *15*, 1416-1463; Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome) Anthony Samsel and Stephanie Seneff. These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through

32-18 (cont.) absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

Submission Issue 18

The Draft EIR is deficient in that it failed to reflect the following research findings:

32-19

Glyphosate disruption of the intestinal microbiome balance: (especially relevant, if someone touched the sprayed vegetation, then handled food that they ate on a picnic)

There is a normal balance of important bacteria in the intestinal tract, with beneficial strains of Enterococcus bacteria keeping in check potentially harmful bacteria, such as Clostridia. Unfortunately, Glyphosate, because it kills beneficial enterococcal bacteria can upset that intestinal bacterial balance leading to the proliferation of harmful Clostridia bacteria, and other harmful bacteria, with devastating consequences. Kruger, M. Shehata, AA, Anaerobe, Vol. 20, pages 74-78, April 2013. These toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

Submission issue 19

The Draft EIR is deficient in that it failed to reflect the following research findings:

Information concerning Glyphosate and Endocrine Disruption (especially with respect to skin absorption when the public touch sprayed vegetation): Since 2007, the EPA has been studying endocrine disruption effects of many pesticides, including Glyphosate. That is because University research has shown that Glyphosate and other pesticides effect human hormones [Federal Register: June 18, 2007 (Volume 72, Number 116)]

32-20

Just 4 years ago, the Endocrine Society's 56 page monograph documented the dangers, including many cancers, posed by the endocrine disrupting chemicals now being evaluated by the EPA. (Diamonti-Kandarakis, E., Endocrine Reviews Vol 30, 2009) These potential toxicity findings, combined with the fact, as shown in earlier submission issues, of the extreme persistence of glyphosate, will endanger the public through skin absorption, and even ingestion, when people touch the sprayed vegetation and then handle food while picnicking.

Submission issue 20

The Draft EIR is deficient in that it fails to list the so-called heribicidally inert constituents of the pesticides listed as proposed for use, and therefore is obviously (especially with respect to skin

32-21

absorption when the public touch sprayed vegetation) deficient in that it fails to provide information about: (note, as you aware, the use of the term “inert” with respect to pesticide mixtures, implies only that, from an herbicidal perspective, the constituent described as being an inert, is only inert with respect to herbicidal effects. For instance, and obviously hyperbolic, if an herbicidal mixture contained “Cyanide”, an obviously extremely-dangerous-to-people substance, cyanide, because it does not hurt vegetation could simply be included as an “inert”, and not actually be named on any MSDS or label related to the herbicidal mixture in which it was contained.)

1) The environmental and human health toxicities of such agents, and

2) The environmental and human health toxicities that would result when, due to spraying of areas close to each other, these agents interact with each other, and or interact with surfactants that are part of mixtures also being used, and/or interact with the herbicidal constituents, and/or the herbicidally inert constituents, and/or the surfactant constituents contained in other herbicidal mixtures being applied in adjacent areas, or areas to which one or another of the above named constituents may migrate.

Submission issue 21 32-22

The Draft EIR is deficient in failing to note that the combination of the surfactant, which a county official, Ms. Martin, has told me is planned for use with glyphosate, has never been tested for safety, since that combination mixture is not sold as a mixed product. For this reason, the draft EIR is deficient in that it does not consider the degree to which the proposed surfactant might, since it is used for the purpose of increasing absorption of pesticide, might also lead to human health harms by increasing glyphosate absorption through the skin. Nor have any other surfactant of the same non-ionic configuration been tested for such effects.

Respectfully submitted draft EIR comments.

From William Rothman, MD.

14 Cliff Road

Belvedere, CA. 415-435-1096

Attachment to Letter 32

Final Report

Environmental decay of glyphosate in broom-infested Mt. Tamalpais soils and its transport through stormwater runoff and soil column infiltration

Submitted to

Marin Municipal Water District
Corte Madera, CA 94925

Submitted by

Hyun-Min Hwang and Thomas M. Young
Environmental Quality Laboratory
Department of Civil and Environmental Engineering
University of California, Davis

April 19, 2011

INTRODUCTION

Wildfires can cause serious damage to biological diversity and structure and can also promote significant erosion that reduces the capacity of reservoirs and degrades the quality of water that provides drinking water. To manage and reduce the risks of wildfires, Marin Municipal Water District (MMWD) is currently updating its Vegetation Management Plan (VMP) that was originally adopted in 1994. The VMP also addresses concerns about degradation of habitat and biological resources in the District's watersheds. One of the severe threats is expansion of invasive weeds (e.g., *Genista monspessulana*) that provide fuels for wildfire and disturb ecological health. A part of this update is to identify feasible and safe methods of controlling weeds in the Mt. Tamalpais watersheds. Currently, chemical weed control by application of herbicides is being considered as one of the effective and cost-efficient weed management actions. However, due to possible impacts of herbicides on the health of humans and wildlife, considerable concerns about chemical weed control have arisen.

Recently, MMWD is considering using a mixture of Aquamaster and Competitor to control weeds. Glyphosate is the active ingredient of Aquamaster that does not contain surfactants. Competitor is a mixture of surfactants (98% ethyl oleate) that are designed to increase the effects of herbicides. When herbicides are mixed with surfactants, typically they are more bioavailable and thus can be degraded more rapidly by microorganisms. Surfactants may also increase wash-off of soil bound glyphosate and its soil column infiltration rates. Reported environmental half-lives of glyphosate in forest soils range mostly between 10 and 60 days (Feng and Thompson, 1990; Newton et al., 1994; WHO, 1994), depending on field conditions such as microbial activity, foliage litter coverage, and soil moisture content. Some studies reported even longer half-lives of up to 2 years (WHO, 1994). This wide variability of literature half-life values hampers MMWD from developing protective herbicide application strategies regarding the timing and rates of herbicide application for weed control. During winter, when frequent precipitation is expected, especially in northern California, residues of glyphosate can be washed away from the application areas by stormwater runoff that may enter receiving water bodies providing drinking water. Groundwater can also be contaminated through soil column infiltration of glyphosate. MMWD is considering an herbicide application window (July 15 through September 15) to minimize possible wash off by stormwater runoff, if the herbicide application is adopted for weed control in the future in the Mt. Tamalpais watersheds. Herbicide mixtures applied at different portions of this window may decay at different rates because ambient environmental conditions are different. Herbicide mixtures applied in the late portion of the application window may not be degraded below safe levels before stormwater runoff washes them away from the application areas. However, no systematic research regarding the persistence of glyphosate and its potential impacts on the quality of surface water and groundwater has been conducted in the Mt. Tamalpais watersheds.

This study was designed to investigate the decay of glyphosate in broom-infested soil in Mt. Tamalpais. Decay rates of glyphosate will provide critical information required to decide appropriate application timing to minimize any adverse effects of glyphosate. This study also investigated transport of glyphosate through stormwater runoff and soil infiltration. Due to limited budget, this study tested worst-case scenarios. The results will be incorporated into the existing risk assessment model built previously for the District.

BACKGROUND

Glyphosate (N-phosphonomethylglycine) is a post-emergent and non-selective organophosphorus herbicide that is widely used to control weeds in agricultural, aquatic, forestry, and residential settings. Octanol-water partition coefficients (log K_{ow}) of glyphosate vary from –2.8 to –3.5, indicating that its bioaccumulation potential is very low. Detailed information about environmental fate and toxicity of glyphosate are available in reports published by WHO (1994), OEHHA (2007), and MMWD (2008).

Once glyphosate reaches soil, typically it is strongly adsorbed onto the soil forming insoluble complexes with soil cation exchange sites. Major environmental dissipation processes include microbial degradation, hydrolysis, and photolysis. Due to the low vapor pressure of glyphosate, loss through evaporation is minimal. Glyphosate is mainly degraded to AMPA that is eventually transformed to inorganic constituents, including phosphate and carbon dioxide. The environmental half-life of glyphosate in soils typically ranges from 10 to 174 days (WHO, 1994), depending on soil and climate conditions. AMPA is equally or less stable in the environment and less toxic than glyphosate.

Although the water solubility of glyphosate is high (12 g/L), glyphosate mainly exist in a particle bound form in aqueous solutions because of its relatively high solid-water partition coefficients (K_d), between 5,000 and 340,000 L/kg. This distribution coefficient indicates that, in the aqueous phase, glyphosate preferentially binds to soil particles and thus in flowing water such as stormwater runoff, particles are likely a major vector carrying glyphosate. Precipitation, soil composition, drainage type, and other parameters influence the leaching of glyphosate from soil. Field and laboratory studies indicate that glyphosate generally does not move vertically in the soil below the topmost 15 cm soil layer (U.S. EPA, 1993).

There are large amounts of data on potential acute health effects related to human exposure to glyphosate. Serious poisonings are rare because glyphosate is not well absorbed through the skin or by inhalation, the most common routes of exposure. The California Office of Environmental Health and Hazard Assessment (OEHHA, 2007) reported a public health goal of 0.9 mg/L (900 ppb) for glyphosate in drinking water. They concluded that this public health goal provides adequate protection for the general population and potential sensitive subpopulations such as pregnant women and their fetuses, infants, and the elderly.

SAMPLE COLLECTION AND CHEMICAL ANALYSIS

Study sites

Total 6 sites (Figure 1) were selected for the present study. Three sites (A, B, and C) were selected to investigate potential wash-off and transportation by stormwater runoff and soil infiltration of glyphosate. Glyphosate application area for both sites A and B was 30 feet by 30 feet and smaller for site C (10 feet by 20 feet). For the sites A and B, the buffer zone was 30 feet. Under the draft, revised VMP, MMWD is considering buffer zones (at least 100 feet from creeks, streams, and reservoirs used for drinking water production), in which herbicides will not be applied to minimize any possible input of herbicides to surface water through stormwater runoff. If no herbicide is detected in stormwater runoff collected for the present study with narrower buffer zone, we can assume that herbicide will not be detected in settings with wider buffer zones. Environmental settings of the sites A and B are very different. The site A is within a relatively flat area and covered by a thin layer of plant litter, while the site B is within a relatively steep area and covered by a thick layer of plant litter, which could hold substantial amounts of water. Site C is within a flat, densely shaded area immediately adjacent to a newly constructed retaining wall where native soils were disturbed and amended with unconsolidated fill material during construction. The environmental settings of sites A, B, and C are typical for broom-infested sites in the Mt. Tamalpais watershed.

Originally, the sites A and B were also supposed to be used for glyphosate degradation test. However, there was rainfall about a week after the application, which is very unusual at this time of year. Because the glyphosate degradation might be accelerated by the extra moisture supplied by this unexpected rain, we decided the environmental conditions did not represent typical conditions during the application window and thus we didn't continue glyphosate degradation study in summer of 2009.

In the summer of the following year, two additional sites (D and E) were selected to investigate the degradation of glyphosate applied to broom leaves. Site D was selected as mostly exposed to sunlight and site E was selected as mostly shaded site, but it turned out that the site D was exposed to sunlight in the morning and shaded in the afternoon and vise versa for the site E. To minimize sampling errors resulting from an uneven spray pattern (see below), one site (F) near the Sky Oaks Ranger Station was selected for degradation of glyphosate in surface soil. This site had been shaded always and thus degradation by direct UV radiation was likely to be negligible.

Glyphosate application

MMWD is considering using a mixture of Aquamaster and Competitor to control weeds and thus the same herbicide mixture (2% Aquamaster, 3% Competitor, and 95% water) was applied to each site at a maximum rate (2 quarts per acre). Glyphosate is the active ingredient of Aquamaster that does not contain surfactants. Competitor is a mixture of surfactants (98% ethyl oleate) that are designed to increase the effects of herbicides. A blue dye (Blazon) was also added to the mixture as an indicator to show application patterns and application areas. Application method was targeted spraying onto individual plants with a backpack sprayer. For this reason, initial glyphosate concentrations in the surface soil were expected to be very heterogeneous. To account for errors that might be caused by sampling in the heterogeneous environment, the mixture was sprayed again on a separate site (F) where the application could be controlled. For this soil half-life study, the herbicide mixture was sprayed evenly.

Sample collection

Surface stormwater runoff samples were collected at the bottom end of the buffer zone (30 feet) of the sites A and B for three rain events. Two events were natural rain events and one event was artificial rain event simulated by spraying tap water with the help of a fire truck. For the two natural rain events, two pre-cleaned stainless cans (40 L) were installed on the ground for each site a few days prior to rainfalls. The cans were retreated and transported to the laboratory after the rainfalls. No leaves were collected from the ground. Upon arrival at the laboratory, the stormwater runoff samples were filtered using glass fiber filters (Whatmann GF/F, 0.7 um pore size). Filtered water samples and particles on the filter papers were stored in a cold room (4 C) and a freezer (-20 C), respectively, until chemical analysis was performed. We were not able to collect any runoff samples from the site B from natural events, though this site is within a relatively steep area, because the surface of this area was covered by a thick layer of plant litters, which could hold substantial amount of water. Since this type of environmental setting is common in the Mt. Tamalpais watershed, transportation by direct runoff early in the rainy season when soils are not saturated is expected to be minimal. When the artificial rain event was applied to this site, even about 15,000 L of tap water sprayed to the site B for two hours (equivalent to 215 cm/day (= 7 ft/day) of rainfall), failed to produce any runoff.

Soil core samples (3 cores per each application plot) were collected using PVC pipes (3.18 cm ID · 60 cm long) in June 2010 to investigate the first year soil infiltration of glyphosate. Six additional soil cores were collected from the application site C to perform laboratory infiltration simulation study. All core samples were transported to the laboratory immediately. The cores for the first year infiltration were sliced by 5cm interval and stored in a freezer (-20 C) until chemical analysis was performed. Because the core soils were compressed while pushing the pipes down through the soil, we marked the depth of core pipes pushed down through the soil and actual soil core depth inside the pipes to calculate soil core compression. Actual depth of the 5 cm of the collected soil layer was turned out to be 6 cm.

Broom leaves were collected from the application sites D and E over 87 days (June 10, 2010-August 30, 2010) with one or two weeks of interval. Broom leaves were randomly collected from at least 10 stems and placed in pre-cleaned aluminum foil and Ziploc bags. Blue dye could be observed clearly only up to two weeks until the broom leaves were still greenish yellow, so the blue dye could be used only as a short-term indicator. When the sites were visited again for sampling two weeks after the application, most broom died (Figure 2). Some broom remained alive up to 7 weeks after the application presumably because the amount of the herbicide mixture they received was insufficient to kill them. Visual inspection indicated that a significant fraction of dead leaves were still attached on the stems and branches and some dead leaves were detached and fell to the ground. No attempts were made to quantify fractions of detached leaves. For each sampling, stems or branches with dead leaves were collected. No leaves were collected from the ground. Collected samples were transported immediately to the laboratory and stored in a freezer (-20 C) until chemical analysis was performed.

Surface soil samples were collected from the application site F over 80 days (June 17, 2010-August 30, 2010) with one or two weeks of interval. For each collection, three replicate of the top surface soils (0-0.5 cm) were collected in Teflon tubes. Each collection spot was marked after collection to avoid collecting soils from the spots previously collected. Collected samples were transported immediately to the laboratory and stored in a freezer (-20 C) until chemical analysis was performed.

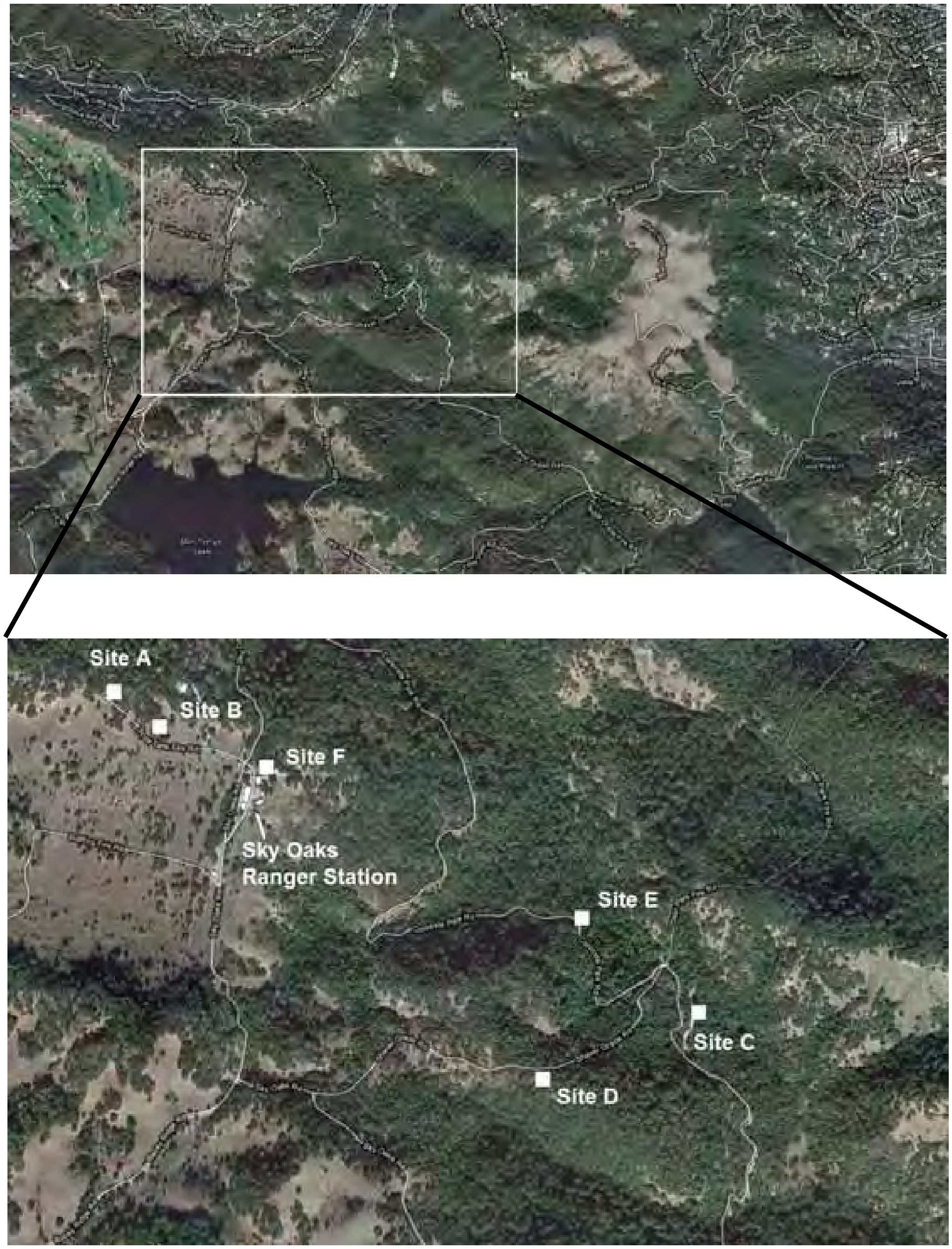

Figure 1. Study sites

Day 0

Week 1

Week 2

Week 3

Week 5

Week 7

Figure 2. Changes of broom leaves after the application of the herbicide mixture (glyphosate plus surfactant) in summer of the year 2010.

Laboratory infiltration simulation

For the laboratory infiltration simulation, 200 mL of de-ionized Milli-Q water was added to each of three cores collected in June 2010 from the site C. The volume of water added to the cores is equivalent to 25 cm of rainfall. The added water was allowed to move down through the soil cores by gravity for three days until no dripping from the bottom of the cores was observed. The cores were sliced by 5 cm interval and stored in a freezer (-20 C) until chemical analysis was performed.

Sample analysis

Solid samples were analyzed using a modification of the method (Huang et al., 2004) reported by our laboratory. Stormwater samples were analyzed using a modification of the method reported by U.S. Geological Survey (Lee et al., 2002). To extract glyphosate in water samples, 1 mL of filtered water and 100 µL of surrogate solution containing ^{13}C-labled glyphosate and ^{13}C-labled AMPA was placed in 5 mL glass vials. Solution in the vials was concentrated to dryness using nitrogen gas. The target compounds were then redissolved with derivatization agents, 400 µL of TFF (2,2,2-trifluoroethanol) and 800 µL TFAA (trifluoroacetic anhydride), to change the target compounds into more volatile forms, which can be analyzed by gas chromatography. The vials were placed on a hot plate (80 ºC) for 1 hour to enhance derivatization. After the solutions were evaporated to dryness under nitrogen, they were redissolved with 1 mL of ethyl acetate. The extracts were transferred into 2 mL GC vials and internal standard (d_{10}-pyrene) was added.

To extract glyphosate in soil samples, about 5 g (fresh weight) of homogenized soil, and 100 µL of surrogate solution, and 10 mL of aqueous solutions containing 0.25 M NH_4OH and 0.1 M KH_2PO_4 were added into Teflon vials. After 1 hour of extraction in a sonication bath, the vials were shaken on a rotary tumbler for 24 hours. After centrifugation at 2500 rpm for 30 minutes, the supernatant was transferred into 20 mL vials. The samples were extracted again with 10 mL of the aqueous solution and the supernatant was combined together. One mL of extracts was transferred into 5 mL glass vials and processed using the method identical to that used for water samples as described above. To extract target compounds in broom leaves, about 150 leaves were placed in Teflon vials and processed using the same procedure used for the soil samples.

To measure water content, about 1 g of soil and leave samples were dried in an oven (60 ºC) for 24 hours. Derivatized glyphosate and AMPA were identified and quantified using a GC-MS (Agilent 6890 GC and Agilent 5973 MSD) equipped with an Agilent DB-5MS column (30 m x 0.25 mm, 0.25 µm film thickness). The injector temperature was 240 ºC. The initial oven temperature was 70 ºC and increased to 240 ºC at 15 ºC/min and held for 5 min. The mass selective detector was operated in EI (electron impact ionization) mode and SIM (selective ion monitoring) mode. All reported concentrations are dry weight basis. For QA/QC, each batch of the samples included a laboratory procedural blank and duplicate sample. Glyphosate and AMPA were not detected in all blank samples. Laboratory procedural blank samples contained only extraction solutions and surrogate compounds and were processed in the same way as that used for the field samples. Any detection of target compounds in blank samples indicates that samples are contaminated in the laboratory by unknown sources and target compounds detected in field samples might be also linked to laboratory contamination. Relative percent differences of the duplicate samples were less than 30%. To quantify target compound concentrations more accurately, isotope labeled surrogate standards were spiked to all samples. Recoveries of surrogate standards were variable, ranging from 40 to 95%, which is commonly observed when target compounds need to be derivatized for GC analysis. Concentrations of target compounds in all samples were adjusted using the surrogate recovery percent. When surrogate recovery is 80%, then target compound recovery is also assumed to be 80%. It indicates that 20% of target compounds were not derivatized and/or lost while the samples were processed in the laboratory. In this case, the final concentration is adjusted for the loss (20%), which is a standard procedure that should be followed to analyze environmental samples for organic compounds. If no surrogate standards are used, especially when the target compounds need to be derivatized, analytical results are significantly less reliable.

RESULTS AND DISCUSSION

Half-life in soil

Changes in glyphosate and AMPA concentrations in the surface soils are presented in Figure 3. Initial AMPA concentration was much lower than glyphosate concentrations and AMPA concentrations declined almost in the same rate as that of glyphosate. Other studies also found the same pattern (Feng and Thompson, 1990; Newton et al., 1994). Considering much lower concentrations and toxicity, environmental impacts of AMPA is likely to be negligible. Their half-lives in soil were calculated using a first-order degradation equation. Half-life of glyphosate in soil was 44 days, which is within the range (30 to 60 days) typically reported in the literature (Feng and Thompson, 1990; Newton et al., 1994; WHO, 1994), though some studies reported much shorter (3 days) or longer (2 years) half-lives in soil (WHO, 1994). Half-life of AMPA in soil was 46 days. The present study supports that the half-life (50 days) selected by Pesticide Research Institute for the prediction of the transport of glyphosate in broom-infested Mt. Tamalpais watershed is in good agreement with the field measured value. The observed half-life of glyphosate in soil implies that more than 50% of soil imbedded glyphosate would be degraded during the proposed application window (July 15 through September 15) if the application is made in early part of the application window. It is commonly known that pesticides aged in soil particles desorb much less than freshly applied pesticides (Alexander , 1995; Park et al., 2004; Regitano et al., 2006), indicating that aged glyphosate is less susceptible to wash-off by stormwater. Ratcliff et al. (2006) showed that glyphosate didn't cause any significant impacts on microbial community structure when glyphosate is applied at the recommended field rate (less than 5 kg/ha), which is much higher than the rate (less than 2 qt/ac = 1.14 kg/ac = 2.82 kg/ha) used in the present study.

Half-life in broom leaves that failed to drop to ground

Concentrations of glyphosate in broom leaves didn’t exhibit significant changes over the 84 days of study period for the both sites (Figure 4), indicating that half-life of glyphosate is likely to be much longer than 84 days as long as the leaves remain attached to the stems and branches. This slow degradation of glyphosate might be due to limited microbial activity on the leaves and time of year when plants are operating closer to dormancy. Photolysis also seemed to be insignificant. Large variations observed in glyphosate concentrations were presumably because the amount of glyphosate in each broom leaf was not homogeneous. As shown in Figure 2, many leaves were still attached to the stems and branches even 7 weeks after the application. Considering broom leaves were collected from multiple stems and branches randomly, glyphosate data indicates that broom leaves remained on the stems and branches still had herbicide mixture at levels similar to those found in early period samples. To calculate overall degradation of glyphosate, the slow degradation of glyphosate on leaves needs to be combined together with relatively faster degradation in soils. Because the present study didn't quantify what fraction of the leaves remained on the stems and branches during the study period, the overall half-life remains inconclusive.

The applied herbicide mixture dried within several hours of application so extra cautions are needed during this period to avoid any possible elevated exposure of humans to the applied mixture. Once the applied herbicide mixture dries, exposure of humans to the mixture through gentle brushing up against treated vegetation is expected to be substantially less than exposure to wet herbicide mixture. It is commonly known that glyphosate has a tendency to quickly penetrate into the internal structure of plant leaves (Gougler and Geiger, 1981; Feng et al., 1998, 1999). The fraction of the applied herbicide remained on the surface of the leaves likely declines over time, reducing the potential for dermal exposure. Although the present study was not designed to determine the extent of the exposure through dermal contact with the glyphosate treated vegetation, dermal contact is not likely a significant exposure route because glyphosate is poorly absorbed through the human skin. In a study using human autopsy samples, less than two percent of the applied glyphosate penetrated the skin when Roundup was applied in 1:20 to 1:32 dilutions to thigh skin (Wester et al., 1991). Glyphosate is quickly absorbed by leaves and shoots of weeds but does not penetrate woody stems of trees and animal skins.

Transport by surface stormwater runoff and soil infiltration

Glyphosate and AMPA were not found in both dissolved and particle phases of all stormwater runoff collected from the application site A. Roy et al. (1989) also reported no glyphosate in surface runoff samples. It is likely to be because glyphosate and AMPA tend to be strongly adsorbed to plant litters and soil particles that generally do not move by runoff especially in forested environments. No stormwater runoff samples were collected from the application site B because the site failed to produce run-off.

Glyphosate was detected in core soils up to 30 cm deep with the highest concentrations in the top layer (Figure 5). AMPA was not detected below 18 cm, which is presumably because AMPA is less water soluble than glyphosate. Other studies (Roy et al., 1989) also found similar depth profiles in forest core soils. Laboratory infiltration simulation exhibited that the glyphosate could penetrate deeper as water infiltration rate increases (Figure 6). But the water infiltration rate used for the laboratory study was not realistic. Considering relatively fast degradation of glyphosate in the surface soil and slower infiltration rates, this deeper infiltration is unlikely to happen under the real conditions

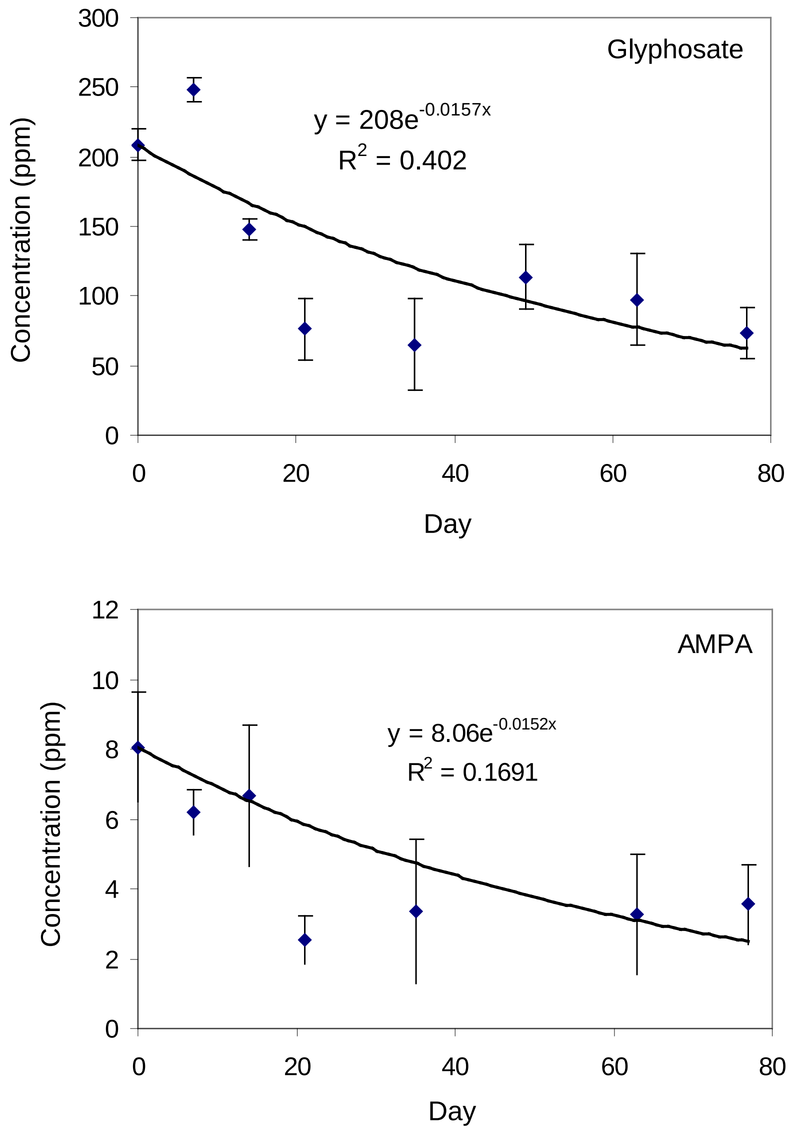

Figure 3. Changes of glyphosate and AMPA concentrations in the surface soils in Mt. Tamalpais.

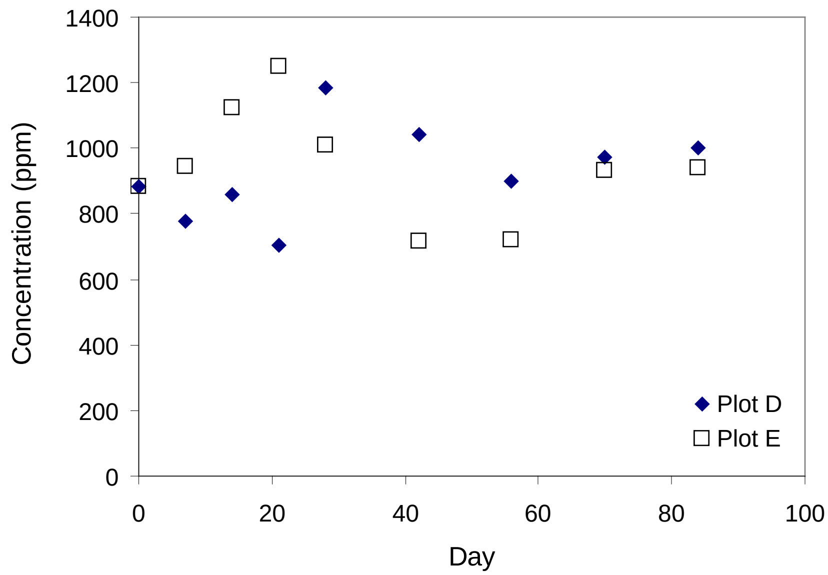

Figure 4. Changes in concentrations of glyphosate in broom leaves (still attached to plant) after the application of the herbicide mixture (Aquamater plus Competitor).

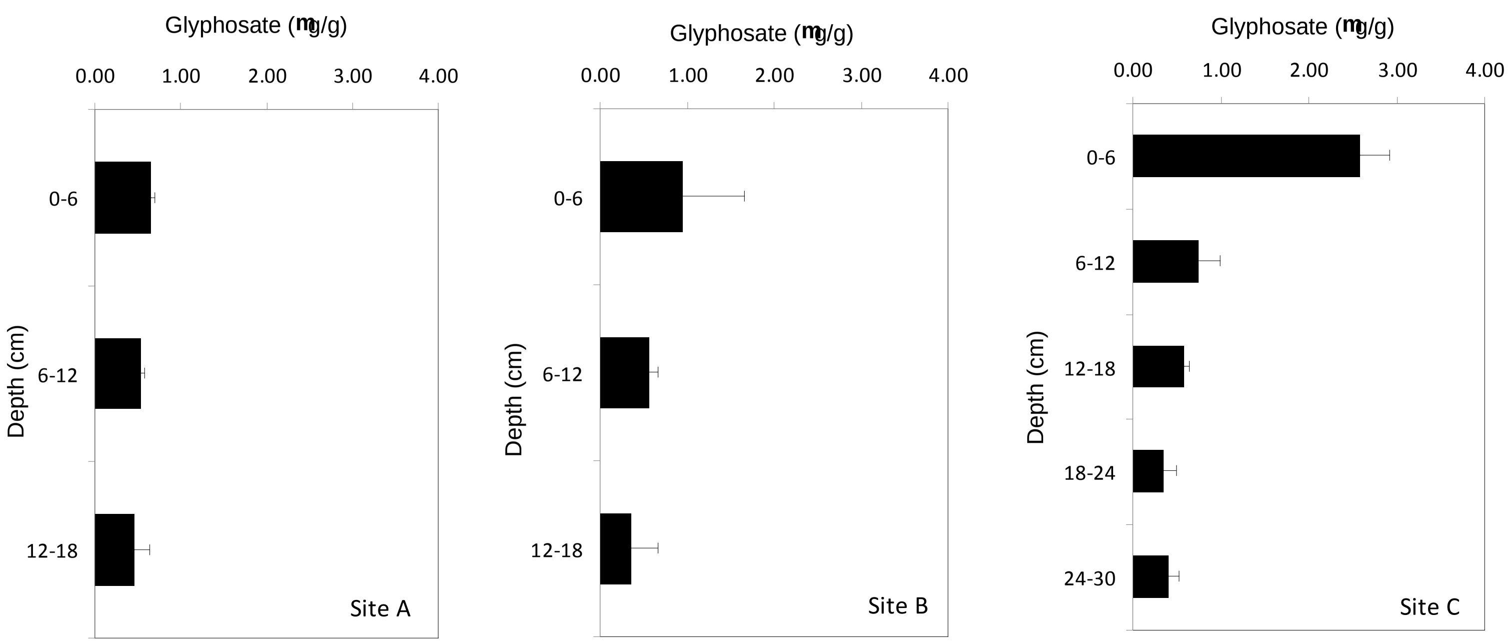

Figure 5. Glyphosate concentrations in core soils collected from the application sites A, B, and C in June 2010.

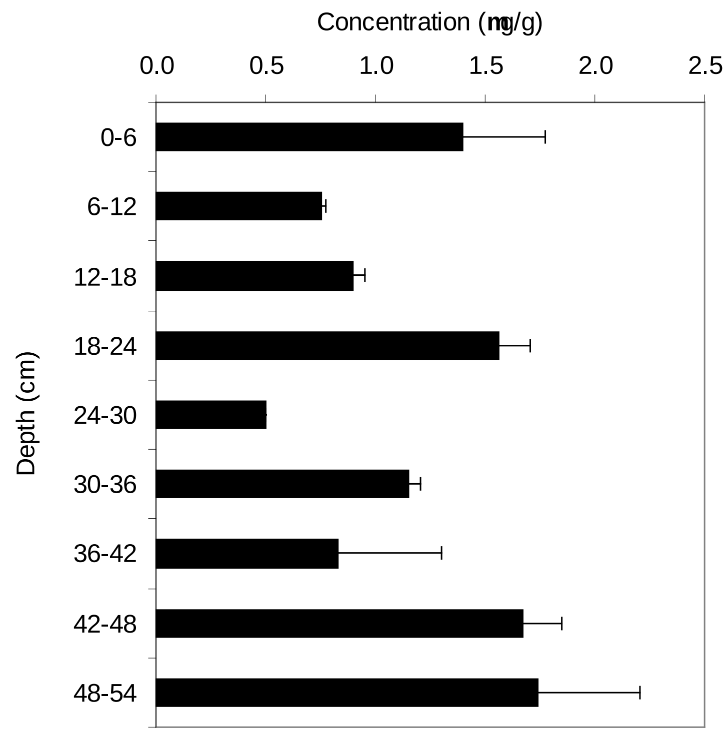

Figure 6. Glyphosate concentrations in core soil layers after the laboratory infiltration simulation. Glyphosate concentrations are averages of two soil cores collected from the application site C.

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RESPONSE TO COMMENT LETTER 32 - WILLIAM ROTHMAN, MD UNDATED

Response to Comment 32-1

Please see **Master Response 6 – Impact Evaluation** for a discussion on cumulative impacts of herbicide mixtures and synergism. Refer to **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion on adjuvants and inert ingredients.

Response to Comment 32-2

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate, skin absorption, safety, and the WHO's conclusions regarding glyphosate.

Response to Comment 32-3

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a description of surfactants used by the District and cumulative impacts of adjuvants and inert ingredients. Note that the District does not use surfactants containing POEA.

Response to Comment 32-4

The Draft TPEIR provided an independent analysis of risk relevant to the vegetation management practices of the MCOSD. Where appropriate, references to the MMWD were made for purposes of comparison only.

Response to Comment 32-5

See Response to Comment 32-03.

Response to Comment 32-6

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate and exposure. Refer to **Master Response 1 – Multiple Chemical Sensitivity** for a discussion on chemical sensitivity. All populations, including potentially sensitive populations (e.g., elderly, infants, etc.) were considered. The degree of exposure to which these populations have to herbicides is extremely limited and less-than-significant. Please see **Master Response 5 – Herbicide Use** for a discussion on procedures taken to prevent exposure to human receptors.

Response to Comment 32-7

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate and effects on soil and non-target vegetation. Refer to **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion of adjuvants, inert ingredients, and cumulative impacts of herbicide mixtures.

Response to Comment 32-8

The commentor discusses the use of *Arytinnis hakanis* for biological control of invasive French broom, and states that the draft TPEIR is deficient in that it does not consider the role that natural predators of broom could play for control purposes. The VBMP is a comprehensive plan providing the MCOSD with strategies for effectively and efficiently implementing a vegetation management program. It is not a plan that prescribes specific treatment measures. The plan requires the District to use an IPM approach that requires the use of the least harmful most effect treatment method. The information presented by the commentor is noted. Chapter 4 of the VBMP provides a comprehensive approach to vegetation management, including invasive plant control and IPM. The IPM approach of MCOSD would include consideration of any approved and appropriate biological controls. However, the VBMP is not intended to provide specific control methods for every target invasive species. The fact that the use of *Arytinnis hakanis* was not specifically referenced as possible control method in either the draft VBMP or the draft TPEIR does not mean either document is deficient, as stated by the commentor.

Response to Comment 32-9

The commentor discusses the possible use of *Aceria ginistae* for biological control of Scotch broom. The commentor states that this gall mite is now present in California, and believes that entomological surveys should be conducted of the MCOSD preserves to determine the degree to which Scotch broom may have already become infested by *Aceria ginistae*. That if *Aceria ginistae* is a successful control agent of Scotch broom, that use of this species as part of the IPM for invasive species control may substantially reduce the need for chemical treatments, and the TPEIR needs to take into account the possible beneficial use of this species. As with *Arytinnis hakanis* discussed in Response to Comment 32-8, the IPM approach of MCOSD would include consideration of any approved and appropriate biological controls. However, the VBMP is not intended to provide specific control methods for every target invasive species. The VBMP is a comprehensive plan providing the MCOSD with strategies for effectively and efficiently implementing a vegetation management program. It is not a plan that prescribes specific treatment measures. The plan requires the District to use an IPM approach that requires the use of the least harmful most effect treatment method. The fact that the use of *Aceria ginistae* was not specifically referenced as possible control method in either the draft VBMP or the draft TPEIR does not mean either document is deficient, as stated by the commentor.

Response to Comment 32-10

The commentor states that the draft TPEIR is deficient because it fails to take into account the possible use of a range of invertebrate species known to eat broom and other undesirable vegetation, and that the draft TPEIR needs to take into account the possible beneficial use of these species. As with the species considered above in Responses to Comments 32-8 and 32-9, the IPM approach of MCOSD would include consideration of any approved and appropriate biological controls. The VBMP is a comprehensive plan providing the MCOSD with strategies for effectively and efficiently implementing a vegetation management program. It is not a plan that prescribes specific treatment measures. The plan requires the District to use an IPM approach that requires the use of the least harmful most effect treatment method. . The fact that the use of these and other invertebrates for possible biological control was not specifically referenced as possible control method in either the draft VBMP or the Draft TPEIR does not mean either document is deficient, as assumed by the commentor.

Response to Comment 32-11

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate and exposure through skin absorption. See Response to Comment 32-06.

Response to Comment 32-12

Please see **Master Response 2 – Use of Glyphosate** for a discussion on glyphosate environmental fate, safety, and exposure through skin absorption. See Response to Comment 32-06.

Response to Comment 32-13

See Response to Comment 32-12.

Response to Comment 32-14

See Response to Comment 32-12.

Response to Comment 32-15

See Response to Comment 32-12.

Response to Comment 32-16

As discussed in **Master Response 2 – Use of Glyphosate** and consistent with the risk screening analysis presented in the Draft TPEIR, the impacts of glyphosate use to amphibians would be less-than-significant; therefore, glyphosate use is not anticipated to increase the risk of West Nile Virus through preventing tadpoles or frogs from feeding on mosquito larvae. Please refer to **Master Response 2 – Use of Glyphosate** for further discussion of glyphosate and effects on wildlife.

Response to Comment 32-17

See Response to Comment 32-12.

Response to Comment 32-18

See Response to Comment 32-12.

Response to Comment 32-19

See Response to Comment 32-12.

Response to Comment 32-20

See Response to Comment 32-12. As discussed in **Master Response 2 – Use of Glyphosate**, the USEPA has evaluated glyphosate's potential for endocrine disruption and concluded that there is no convincing evidence that glyphosate has the potential for endocrine disruption.

Response to Comment 32-21

Please see **Master Response 4 – Adjuvants and Inert Ingredients** for a discussion of adjuvants, inert ingredients, and cumulative impacts of herbicide mixtures.

Response to Comment 32-22

See Response to Comments 32-12 and 32-21.

Public Hearing Comments

MARIN COUNTY PARKS AND OPEN SPACE COMMISSION
MARIN CIVIC CENTER, PLANNING CHAMBERS (ROOM 328), SAN RAFAEL, CALIFORNIA
DRAFT MINUTES FOR REGULAR MEETING HELD ON MAY 21, 2015

COMMISSIONERS PRESENT:	Raphael Durr Larry Kennings David Ross Shelly Scott Dennis Scremin Greg Zitney
COMMISSIONERS ABSENT:	Roger Harris

1. CALL TO ORDER

The meeting was called to order at 3:00 p.m. by Chair Shelly Scott.

2. PUBLIC COMMENT

FootPeople committee member Linda Novy presented a report on violations and enforcement on Marin County's open space preserves, and asked that that the Parks and Open Space Commission review their report and consider adding the subject matter to a future agenda.

A member of the public agreed with information presented by the Foot People.

Marin Conservation League member Nona Dennis discussed behavior, education, safety and enforcement issues on trails, and collaborative work between user groups to change user behavior/culture on open space trails. A Marin County Trail Partners "Slow and Say Hello" pamphlet discussing sharing trails and safe communication on trails for walkers, hikers, joggers, equestrians and mountain bikers was distributed to commissioners.

Tom Boss (representing the Marin County Bicycle Coalition) discussed upcoming Trail Partners volunteer events, ongoing collaboration between user groups regarding trail safety, and fostering safe and courteous interaction between all trail user groups.

A member of the public commented on the "significant impact" that night use of open space preserves has on local wildlife, and requested that the Parks and Open Space Commission study this important issue as soon as possible.

Kim Banish, Director of Operations with Trips for Kids (a 2014 Measure A grant recipient), discussed the need for transportation to open space preserves by those in underserved communities.

A Novato resident offered brief comments about the FootPeople's report, urging commissioners to thoroughly read the document, and suggested that information in the report will help when guidelines for activities on open space preserves are being crafted.

A member of the public offered comments about a letter written by a high school mountain biker that was recently published in the Marin Independent Journal.

3. DIRECTORS REPORT

Director and General Manager Linda Dahl stated that she appreciates the "great ideas" expressed by members of the public, and is especially fond of the concept of all groups working together to change the culture on preserves. She also greatly appreciates the "hard work" done by the Foot People in creating the report they submitted to the department. Ms. Dahl also briefly reviewed issues regarding enforcement on preserves, and measures that are being taken to ameliorate those issues.

Assistant Director Ronald Miska reported about various capital improvement projects either underway or scheduled, including the expected completion date for Phase 1 of the Stafford Lake Bike Park and projects at Hal Brown Park at Creekside that will improve local marsh habitat. He also reported that a public bicycle safety campaign was launched earlier this month, and that additional improvements will be coming to the Mill Valley-Sausalito Pathway in the coming fiscal year.

4. APPROVE MINUTES FOR MEETING HELD MARCH 19, 2015

M/s Zitney/Scremin to approve the Minutes for the meeting held on March 19, 2015.

AYES: Commissioners Kennings, Ross, Scott, Scremin, Zitney

ABSENT: Commissioner Harris

ABSTAIN: Commissioner Durr

5. MEASURE A FISCAL YEAR 2014-15 COMMUNITY GRANT AWARDS

External Affairs Coordinator Kevin Wright, briefly summarized the grant program focus areas, reported that grantees from last year will be giving a presentation to commissioners at their July meeting, and responded to a question from Commissioner Zitney. He also informed commissioners about an event a Measure A grantee will be hosting on July 5 at McNears Beach Park.

M/s Durr/Zitney to recommend to the Board of Supervisors approval of the Sprouts and Wings community grant agreements.

AYES: Commissioners Kennings, Ross, Scott, Scremin, Zitney

NOES: None

ABSENT: Commissioner Harris

Mr. Wright apologized to commissioners and informed them that today they are being asked to approve applications minus the ones received from San Rafael City Schools and LIFT/Levántate. Those two applications are pending until further research has been completed.

M/s Durr/Zitney to revise motion to recommend to the Board of Supervisors approval of the community grant awards, excluding awards to LIFT/Levántate and San Rafael City Schools.

AYES: Commissioners Kennings, Ross, Scott, Scremin, Zitney

NOES: None

ABSENT: Commissioner Harris

The revised motion was passed.

6. DRAFT VEGETATION AND BIODIVERSITY MANAGEMENT PLAN AND DRAFT TIERED ENVIRONMENTAL IMPACT REPORT

Chair Scott addressed why this item is on the commission's agenda, the commission's role in it, and why the meeting is being held now instead of later in the process. She also reviewed procedures and ground rules for the receiving of public comment during the meeting today, and reported that written comments are due to Marin County Parks by July 8, 2015.

Ms. Dahl gave an introduction to the Vegetation and Biodiversity Management Plan, noting that this plan began more than five years ago. In its latest form, this plan is the first comprehensive effort to collect vegetation data for the 16,000 plus acres within the Open Space District for analysis of biodiversity and use as a baseline for future studies and land management.

Ms. Dahl introduced Mischon Martin, Chief of Natural Resources and Planning. Ms. Martin reviewed the process used to create a science based approach to land management, and reported that one of the offshoots is that it will also serve to help increase safety by helping staff to better manage fire fuels on open space lands. District lands are ecologically valuable, and support rare and threatened species, some of which occur only in Marin.

Ms. Martin and Senior Open Space Planner James Raives, project coordinator for the TPEIR and the Vegetation and Biodiversity Management Plan, gave a related PowerPoint presentation. Mr. Raives discussed the California Environmental Quality Act (CEQUA), how it allows for public participation and comment, provides a context for environmental review of future projects, the four key elements of an EIR and how to read one. Mr. Raives reminded everyone that public comments for this project must be received before the close of the business on July 8, 2015.

Ms. Dahl and Mr. Raives responded to questions from commissioners.

PUBLIC COMMENT:

PH-1 A representative from Marin Conservation League (MCL) offered comments on the process, noting that 90 percent of comments the staff will receive will be on the Plan itself, not on the TPEIR. MCL will not be offering comments at this time, but will submit their detailed written response at a later date.

PH-2 A member of the public submitted and then read a written comment opposing the use of glyphosate.

PH-3 A representative from Friends of Corte Madera Creek Watershed offered comments opposing the use of glyphosate on watershed lands. Written comment will be submitted at a later group.

PH-4 A long time conservationist acknowledged the emotions evoked in some people by the use of pesticides, and urged everyone to consider balance, noting that the major issue is not the use of glyphosate, but fire danger. The spot application of an herbicide on invasive species should be supported as one of the tools used by the District to reduce fire danger and support native species on open space lands.

PH-5 A member of the public supported the responsible use of limited amounts of herbicides for the spot treatment of invasive non-native plants on open space lands, and as a method of maintaining the long term viability of Marin's native plant species on open space.

PH-6 A representative from the Marin Audubon Society strongly urged support for the precautionary use of responsibility managed herbicides to remove invasive, exotic and aggressive non-native weeds on open space lands. MCL will not comment on the Draft TPEIR at this time, but will submit a written response at a later date.

Seeing no one else coming forward to speak, public comment time was closed

7. STAFF-COMMISSIONER REPORTS

Commissioner Ross offered compliments about the Road and Trail Management Plan workshop held at Mill Valley. The review of the Measure A grant community submittals was very productive. Outreach was successful and good proposals were received. Receiving an update on the process would be helpful.

Commissioner Zitney reported that he and Commissioner Kennings working closely with Kevin Wright on senior access issues and have also been reaching out to senior communities. He will be meeting with residents of The Redwoods senior housing community in June. A lot of positive feedback has been received about the work they are doing.

Commissioner Kennings reported that he and Commissioner Zitney have been attending inclusive action plan program workshops and focus groups. Staff and consultants are doing a great job, but attendance at some of the functions has been sparse. Mr. Kennings noted issues about accessibility are very important to him. He complimented Marin County Parks Superintendent Brian Sanford for sharing his time and great insight about open space accessibility, all of which will serve to help with him with making decisions in the future.

Commissioner Scremin was impressed with work that has been done by staff members of Marin County Parks. He also complimented Marin County Parks Director and General Manager Linda Dahl on her outstanding accomplishments during the last five years, and wished her well on her pending retirement.

Commissioner Scott concurred with Commissioner Scremin's comments, and said that she will be missed. An amazing amount of work has been accomplished during the last five years.

The meeting was adjourned at 4:45 p.m.

RESPONSE TO PUBLIC COMMENTS SPOKEN AT MARIN COUNTY PARKS AND OPEN SPACE COMMISSION MEETING, MAY 21, 2015

Response to Comment PH-1

Comment noted. The Marin Conservation League did submit written comments on the adequacy of the Draft TPER - see Comment Letter 12.

Response to Comment PH-2

Comment noted. **Master Response 2 - Use of Glyphosate** discusses various issues associated with glyphosate.

Response to Comment PH-3

Comment noted. The Friends of Corte Madera Creek Watershed did submit comments on the adequacy of the Draft TPEIR - see Comment Letter 10.

Response to Comment PH-4

Comment noted. This is not a comment on the adequacy of the Draft TPEIR.

Response to Comment PH-5

Comment noted. This is not a comment on the adequacy of the Draft TPEIR.

Response to Comment PH-6

Comment noted. The Marin Audubon Society did submit comments on the adequacy of the Draft TPEIR - see Comment Letter 11.

APPENDIX A

MITIGATION MONITORING AND REPORTING PROGRAM

APPENDIX A
MITIGATION MONITORING AND REPORTING PROGRAM
MARIN COUNTY OPEN SPACE DISTRICT
VEGETATION AND BIODIVERSITY MANAGEMENT PLAN

INTRODUCTION

The California Environmental Quality Act (CEQA) requires a public agency to adopt a reporting or monitoring program when approving a project or changes to a project, in order to mitigate or avoid significant effects on the environment (Public Resources Code section 21081.6). The program is based on the findings and the required mitigation measures presented in an Environmental Impact Report (EIR) that has been prepared on the project and certified by the lead agency. The reporting or monitoring program must be designed to ensure compliance during project implementation.

Pursuant to the CEQA Guidelines, a Mitigation Monitoring and Reporting Program (MMRP) must cover the following:

- The MMRP must identify the entity that is responsible for each monitoring and reporting task, be it Marin County (as lead agency), other agency (responsible or trustee agency), or a private entity (i.e., the project sponsor).
- The MMRP must be based on the project description and the required mitigation measures presented in the environmental document prepared for the project and certified by the lead agency.
- The MMRP must be approved by the lead agency at the same time of project entitlement action or approvals.

MMRP's are typically designed in chart and checklist format for ease of monitoring and reporting.

LOCATION AND CUSTODIAN OF DOCUMENTS

Consistent with the California Environmental Quality Act, an EIR was prepared to address the impacts of the *Vegetation and Biodiversity Management Plan*. This document, entitled *Vegetation and Biodiversity Management Plan Tiered Program Environmental Impact Report* consists of two volumes (Draft TPEIR dated August 2015, and *Response to Comments to the Draft Tiered Program Environmental Impact Report* dated October 2016.), and is on file with the Marin County Open Space District, along with all the other documents that constitute the record of proceedings.

PURPOSE AND USE OF THE MONITORING AND REPORTING PROGRAM

The purpose of the monitoring and reporting program is to provide Marin County Open Space District with a simple guideline of procedures to ensure that the mitigation measures required under the Final TPEIR are implemented properly.

Since each required mitigation measure must be implemented, a monitoring and reporting chart was created, which is attached to this report. This chart provides the following information and direction for use.

1. The required mitigation measures are listed in the first column, corresponding to the list of measures provided in the Final EIR.
2. The second column lists the agency or entity responsible for implementing the mitigation measure.
3. The third column lists the timing as to when the mitigation measure is to be implemented.
4. The fourth column provides guidance on monitoring and reporting actions to ensure that implementation procedures are followed.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
Biological Resources			
5.1-1(a) To ensure adequate avoidance and protection of sensitive natural resources, including special-status species, **BMP-Sensitive Natural Resources-1** of the VBMP shall be revised to provide specific protocols related to necessary vegetation treatment within the standard 100-foot buffer, further define compensatory mitigation where potential impacts are unavoidable, and provide for long-term monitoring on sensitive natural resources as follows: **BMP-Sensitive Natural Resources -1 -** *Modify Vegetation Management Practices near Sensitive Natural Resources* For ~~construction-related~~ vegetation management activities <u>including those </u>requiring extensive ground disturbance <u>or invasive species treatment </u>in and near known sensitive biological resources, MCOSD will assess the project or proposed action prior to the start of work to suggest modifications to standard procedures considered necessary to help ensure avoidance of impacts to special-status species and other sensitive biological resources. Actions that may be taken include one or more of the following: **Conduct surveys to determine presence or absence of sensitive natural resources.**<u> Prior to performing vegetation management practices in areas with known or suspected sensitive natural resources, appropriate surveys will be performed to verify presence or absence, and to delineate any resources that should be considered as part of management options. This shall include appropriate surveys to determine presence or absence of special-status species, locally rare species, nesting birds, sensitive vegetation types, and wetlands.</u> <u>**Prepare a treatment program where management activities are to occur within a minimum 100 foot buffer**</u>	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
of sensitive natural resources. The MCOSD will prepare a written treatment program for necessary management activities taking place within the 100-foot buffer surrounding an identified sensitive natural resource. The treatment program will evaluate options for the protection and enhancement, if appropriate, identify controls for avoiding and minimizing potential adverse effects on the sensitive natural resource, and include requirements for construction and post-construction monitoring. **Monitor management activities to verify effects on sensitive natural resources and provide adaptive management practices.** Maintain a list of all treatment programs performed in the vicinity of sensitive natural resources, as a method to monitor treatment activities and cross-reference location and year of treatment. An annual monitoring report will be prepared summarizing the results of various Treatment Programs prepared for that year, degree of incursion into the minimum 100 foot buffer area and comparison to broader management activities, and include recommendations for adaptive management practices or revisions to BMPs where warranted based on the results of the annual monitoring. **Define appropriate compensatory mitigation where adverse effects on sensitive natural resources is unavoidable.** Compensatory mitigation will ensure no permanent loss of sensitive natural resources as a result of management practices. Where necessary, details of the compensatory mitigation will be defined in a compensatory mitigation element of the treatment program. The need for compensatory mitigation will depend on the rarity of the affected sensitive natural resource, magnitude and permanence of the impact, and the level of legal protection, if any, for the sensitive natural resource. The compensatory mitigation may include the following components: (1)			

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
identification of a combination of habitat creation, restoration and/or enhancement; (2) development of a monitoring and maintenance program where necessary to document success; (3) establishment of performance standards; and (4) provisions for contingency measures to remediate projects that do not meet the performance standards. **Mark project footprint near sensitive natural resources.** Mark ingress/egress routes, staging areas, and sensitive resources to prevent inadvertent impacts to sensitive resources. **Conduct a worker-training program for all field personnel involved with the proposed vegetation management project prior to initiating activities within the sensitive natural resource buffer.** The program will consist of a brief presentation by the MCOSD Natural Resources and Science staff. The program may include the following: photograph(s) and description(s) of the sensitive natural resource; a description of its ecology and habitat characteristics; an explanation of the measures being taken to avoid or reduce adverse impacts; and the workers' responsibility under applicable environmental regulations. **Inspect ingress/egress routes, escort vehicles, and equipment onto the site if necessary to help prevent impacts on ground nesting and ground dwelling species.** Work should be conducted during bird non-breeding season (published DFW non-breeding season dates are August 15-March 1, but should be adjusted to local conditions), as described in more detail in BMP-Special-Status Wildlife Species-1. **Maintain a 15 MPH speed limit in sensitive habitat areas.** This will reduce the potential for mortality, dust impacts on vegetation and wildlife. For larger projects, water the roads for dust control near sensitive resources. **Secure appropriate authorizations from regulatory**			

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
agencies where jurisdictional habitat would be affected. Where sensitive natural resources are regulated by resource agencies, possibly including the CDFW, Corps, USFWS, NOAA Fisheries, and RWQCB, secure all necessary authorizations in advance of implementing vegetation management and other habitat modifications associated with the VBMP, and comply with all required conditions, conservation measures, and compensatory mitigation provisions. **Provide appropriate seasonal restrictions on management activities within the minimum 100 foot buffer of sensitive natural resources, and incorporate these restrictions into the treatment program.** Seasonal restrictions should include prohibition on herbicides application during the wet season or in advance of forecast rain events.			
5.1-1(b) To provide clarification over the process in protecting special-status habitat and environmentally sensitive areas associated with herbicide treatment, **BMP-General-7** of the draft VBMP shall be revised to acknowledge the requirement for preparation of a Treatment Program within the standard 100-foot buffer setback as follows: **BMP-General-7** *Include Standard Procedures in Construction Contracts* When using contractors to perform vegetation management, the MCOSD will include some or all of the following standard procedures into construction contracts: **Protect environmentally sensitive areas.** The MCOSD natural resource staff shall identify any Environmentally Sensitive Areas in or near construction work areas prior to the start of work, Environmentally Sensitive Areas may include: special-status plant or wildlife species or their habitats (e.g. woodrat nests, habitat for special status plant and wildlife species, individuals or populations of listed	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
special-status plant or wildlife species or locally rare species); wetlands including creeks, streams and related riparian areas; and sensitive vegetation types as described in this report. The MCOSD staff and contractors will fully avoid and protect such areas during habitat restoration work, or will help obtain and comply with necessary permits and regulatory requirements. The MCOSD will prepare a treatment program for management activity proposed within the minimum 100-foot buffer setback to ensure careful controls are fully implemented and conditions are adequately monitored. Where incursion into a standard 100-foot buffer setback is required, all procedures defined in the treatment program, as described in **BMP-Sensitive Natural Resources-1** shall be complied with for work within the Environmentally Sensitive Areas. **Work in and near special status species habitat.** For vegetation work in or near special status species habitat, the contractor is required to comply with requirements of the MCOSD project permits to protect special status species and their associated habitats before and during construction, and to cooperate with the MCOSD in implementing any state and federal permits and agreements for the project. The special status species population plus a buffer should be designated as an "Environmentally Sensitive Area" using lath and flagging, pin flags, or temporary fencing (depending on resource sensitivity to work).The contractor will be required to avoid all designated Environmentally Sensitive Areas and the buffer area during construction, unless allowed under the controls defined as part of a site-specific treatment program as described in **BMP-Sensitive Natural Resources-1**. For any special status species or their habitats that cannot be fully avoided, the contractor will work with the MCOSD to obtain and comply with federal and state Endangered Species Acts, the federal Migratory Bird Treaty Act, and the state Fish and Game Code permits and agreements, where			

Mitigation Measure	***Implemented by***	***When Implemented***	***Monitoring or Reporting Action***
required.			
5.1-1(c) To provide clarification over when surveys are to be conducted in advance of construction-related vegetation management, the first bullet in **BMP-Special-Status Plants-1** of the draft VBMP shall be revised as follows: Surveys will be conducted during the appropriate time of year as necessary to allow for adequate detection, with follow-up surveys conducted as necessary within 14 days of the start of active ground disturbing activities.	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.
5.1-3(b) The following revisions to BMPs in the VBMP shall be implemented by the MCOSD to ensure adequate protection of sensitive natural resources and environmentally sensitive areas, including wetlands and other waters. **BMP-GENERAL-2 -** *Modify Vegetation Management Methods in and near Wetlands, Riparian Vegetation Types. Limit Necessary Work to Low Flow or Low Tide Periods.* Restrict construction-related vegetation management near wetlands in a manner that reduces the potential for sediment or pollutants to enter wetlands. Implement the following BMPs, as needed: ***Establish a buffer of 100 feet from wetland and tidally influenced areas*** (i.e., from the ordinary high water mark of flowing or standing water in creeks, streams, or ponds). Avoid construction work within this buffer area. Where avoidance is not possible, a treatment program will be prepared any time a management activity is to be performed within the 100-foot buffer of a wetland or riparian areas, as called for in **BMP-Sensitive Natural Resouces-1** to ensure careful controls are fully implemented and conditions adequately monitored. If construction work in wetlands and riparian areas cannot be fully avoided, consult with the appropriate state and federal agencies to obtain permits, where required. Within the buffer, restrict routine vegetation management	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	***Implemented by***	***When Implemented***	***Monitoring or Reporting Action***
activities in creeks, streams, other waterways, and tidally influenced areas. Limit vegetation management work to least-harmful methods; restrict herbicides to those that are EPA-approved for use near water. Prohibit activities that disturb soil or could cause soil erosion or changes in water quality. All management activities within the minimum 100-foot buffer zone will be performed as specified in the required treatment program to ensure careful controls are fully implemented and conditions are adequately monitored. **BMP-GENERAL-7** *Include Standard Procedures in Construction Contracts* **-** When using contractors to perform vegetation management, the MCOSD will include some or all of the following standard procedures into construction contracts: *Work in and near wetlands*. Establish a buffer of 100 feet from wetland and tidally influenced areas (i.e., from the ordinary high water mark of flowing or standing water in creeks, streams, or ponds). Avoid construction work within this buffer area. <u>A treatment program will be prepared any time a management activity is to be performed within a minimum 100-foot buffer of a wetland or other sensitive natural resource, as called for in **BMP-Sensitive Natural Resouces-1** to ensure careful controls are fully implemented and conditions adequately monitored.</u>			
5.1-4(b) The following revisions and new BMPs in the VBMP shall be implemented by the MCOSD to address possible substantial modifications to native wildlife habitat as a result of fire fuel management in defensible space zones. **BMP-Fuel Management-13–***Work with County Fire, local fire agencies, and private property owners if Encroachment onto MCOSD Preserves is Necessary to Meet Defensible Space Zone Requirements.* MCOSD will work with County Fire, local fire agencies, and adjacent private property owners to meet Defensible Space Zone requirements around habitable	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
structures. MCOSD will provide guidance to property owners on proper clearance techniques, including: ***Break up "continuous" vegetation.*** Sometimes wildland plants can occur as an uninterrupted layer of vegetation (as opposed to being patchy or widely spaced individual plants).The more continuous and dense the vegetation, the greater the wildfire threat. If this situation is present within the recommended defensible space area, it can be "broken-up" by creating patches or spaces between small groups of plants. Any modifications to continuous vegetation cover will consider possible adverse effects on wildlife habitat values, and the MCOSD shall consider limiting excessive thinning or disruption of continuous canopy to native woodland and forest cover, if necessary to prevent significant impacts to native vegetation and wildlife habitat. ***For some areas, substantial removal of wildland vegetation may not be allowed.*** In these instances, wildland vegetation should conform to the recommended separation distances, be kept free of dead plant material, pruned to remove ladder fuels and reduce fuel load, and arranged so it cannot readily convey a fire from the wildlands to the house. Consideration of the predominant native cover types in the surrounding area and importance of minimizing disruption to native woodland and forest habitat, sensitive natural community types, and other areas encompassing sensitive natural resource will be made as part of any guidance involving substantial thinning and breaking up continuous vegetation.			
Hydrology and Water Quality			
5.2-1(b) In order to reduce impacts on water quality standards described in the SF Bay Basin Plan, as amended by the TMDL for Diazinon and Pesticide Related Toxicity in	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity*	Marin County Open Space District would be responsible for implementing and

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
Urban Creeks (2007), the MCOSD shall adopt the following new best management practices: **BMP-Hydrology and Water Quality (new)** Use only herbicides approved for aquatic and near water environs when treating near any waterbody, including wetlands. **BMP-Hydrology and Water Quality (new)** Prohibit the mixing or loading of herbicides within 100 feet of any waterbody, including wetlands. **BMP-Hydrology and Water Quality (new)** Accidental spills of herbicides should be remediated immediately to minimize the risk of off-site migration in surface runoff or groundwater flow. Remediation should include initial containment, followed by removal using absorbent materials and excavation and removal and proper disposal of surface soils from the spill area. **BMP-Hydrology and Water Quality (new)** Restrict herbicide applications to a 24-hour window with a less than 50 percent chance of rain. **BMP-Hydrology and Water Quality (new)** When applying herbicides in tidal areas, consult with the SFEI's Invasive Spartina Project program staff regarding efficacious methods of treatment to minimize the risk to water quality. **BMP-Hydrology and Water Quality (new)** If use of Triclopyr BEE is considered the only viable control option for invasive plants within the 100-foot buffer zone for aquatic resources, restrict its application whenever possible to the dry season extending from April 15 to October 15 when the likelihood of stormwater runoff is low. If the targeted invasive plants can only be effectively treated during the rainy season (October 15 to April 15), follow the protocols outlined in Mitigation Measure 5.1-1 and document the overriding considerations in favor of its application. **BMP-Hydrology and Water Quality (new)** Apply treatments		*Management Plan.*	overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
within the 100 feet aquatic buffer area in the upstream direction, i.e. treating downstream sites first and then move to upstream sites thereafter.			
5.2-2(b) In order to reduce impacts to erosion and sedimentation from activities related to the implementation of the VBMP the MCOSD shall adopt the following new best management practices: **BMP-Hydrology and Water Quality (new)** *Temporary Erosion and Sediment Control*. Temporary sediment-control practices will be implemented when vegetation management projects result in grading or other significant ground disturbance, local denudation of vegetative cover or has the potential to discharge a significant amount of sediments or pollutants to surface water. Several of the listed temporary practices can also be used as post construction stabilization measures: Information and standard details for temporary erosion-control BMPs can be found in the California Stormwater BMP Handbook – Construction (CASQA 2009). Install temporary fencing around staging areas and along limits of construction when work areas are immediately adjacent to sensitive resources. This will limit the disturbance footprint and help protect resources, including native vegetation, wetlands, and streams, during grading operations. Install linear sediment barriers to slow and filter stormwater runoff from disturbed areas. Fiber or straw roll barriers can also be spaced along the contours of a disturbed area after construction to prevent concentrated flow and stabilize the area until there is sufficient vegetation coverage. Apply one or more of the following to restore or protect areas disturbed by excavation or grading operations: tilling (minimum 6 inch depth) and seeding hydromulch and tackifier	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
planting straw or wood mulch coir (jute) netting biodegradable erosion-control blankets plastic sheeting (only as an interim protection during storm events when construction site is still active) Where denudation of vegetative cover and expected loss of local plant rooting follows an herbicide treatment, mulch, coir rolls or other appropriate erosion control treatment should be installed along the downslope perimeter of the treated area prior to the beginning of the rainy season (October 15). Once the soil within the rooting zone is determined to be free of inhibiting herbicide (or low enough so as not to affect new plant development), the denuded area should be scarified/tilled and seeded with native grasses and forbs and/or planted with desirable native plants that will protect the surface soils from erosion. Cover soil and loose material stockpiles with weighted plastic sheeting when inactive or prior to storm events. Active and inactive material stockpiles will be encircled at all times with a linear sediment barrier. Manage sediment when diverting stream flow. When constructing trail or road stream crossings, a temporary clear-water diversion may be required. The following options will be considered for isolating the work area and protecting resources when diverting stream flow via gravity-fed flexible pipe or active pumping around the work area: sand or gravel bag coffer dam enclosed in plastic sheeting, water-filled dam (e.g., Aqua dam), sheet piling, and turbidity curtains. Manage sediment during dewatering operations. The following options will be considered for applying or containing and treating sediment-laden water produced during dewatering operations: sprinkler system to open area (as			

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
long as there is no visible surface runoff), temporary constructed sediment basin or trap, rented sedimentation tank (e.g., Baker Tank). **BMP-Hydrology and Water Quality (new)** *Erosion Control Measures* Avoid the use of heavy equipment in areas with soils that are undisturbed, saturated, or subject to extensive compaction. If no feasible alternative is available and staging of heavy equipment, vehicles, or stockpiles is unavoidable, limit the disturbance footprint and flag or mark the allowable disturbance area in the field. Following the end of work, newly disturbed soils will be scarified to retard runoff and promote rapid revegetation. Immediately rehabilitate areas where project actions have disturbed soil. Require areas disturbed by equipment or vehicles to be rehabilitated as quickly as possible to prevent erosion, discourage the colonization of invasive plants, and address soil compaction. Techniques include decompacting and aerating soils, recontouring soils to natural topography, stabilizing soils via erosion-control materials, revegetating areas with native plants, and removing and monitoring invasive plants. Stumps may be cut or ground down to the ground level. **BMP-Hydrology and Water Quality (new)** *Grading Windows* - Restrict grading activity to the dry months or during extended dry periods when associated erosion will be reduced to the maximum extent possible. **BMP-Hydrology and Water Quality (new)** *Proper Disposal of Excess Materials Avoid* resource impacts when disposing of materials. Any excess material related to new construction, maintenance, or restoration (including soils, debris, trash, or other materials that need to be removed as part of management activities) will be disposed of at an appropriate			

<table>
<tr><th>Mitigation Measure</th><th>Implemented by</th><th>When Implemented</th><th>Monitoring or Reporting Action</th></tr>
<tr><td>site where materials could not impact sensitive resources.
BMP-Hydrology and Water Quality (new) Sidecasting Construction Material. Avoid sidecasting, or at a minimum contain and remove sidecast material when it has the potential to reach surface waters.
The following “rules of thumb” based on Fishnet 4C Guidelines (2007) will be used as guidance:
<table>
<tr><td>Slope gradient</td><td>Distance to watercourse</td><td>Sidecast rule</td></tr>
<tr><td>Any slope</td><td>Will likely enter watercourse</td><td>Not allowed</td></tr>
<tr><td>≤20%</td><td>≥150 feet</td><td>Allowed</td></tr>
<tr><td>≤50%</td><td>≥300 feet Allowed</td><td>Allowed</td></tr>
<tr><td>>50%</td><td>Long vegetated slope</td><td>Allowed</td></tr>
<tr><td>> 50%</td><td>Shorter, sparsely vegetated slope</td><td>Not allowed</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Geology and Soils</td></tr>
<tr><td>5.3-1 In order to reduce impacts related to landslide and debris flow hazards that would occur with implementation of the VBMP, the MCOSD shall adopt the following new best management practices:
BMP-Geologic Hazards-(new) Project Assessment and Construction Requirements in Geologically Hazardous Areas - Geologic hazards including landslides and debris flows in elevated areas shall be assessed by a geologist or geotechnical engineer and, if present shall be taken into account in the implementation of any ground disturbance treatments.
No further action to address potential geologic hazards would be required if any of the following apply:</td><td>Marin County Open Space District.</td><td>Adopted as a part of the Vegetation and Biodiversity Management Plan.</td><td>Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.</td></tr>
</table>

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
1. The area subject to vegetation management activity is located in an area listed as "stable", "few landslides" or equivalent on the most currently available landslide mapping for the area. 2. The average steepness of the area is less than ten degrees (about 18 percent) 3. There is no visible evidence of landslide activity (e.g. scarps, crooked trees, landslide-generated debris piles) within the area, as documented by a field reconnaissance, and 4. There are no habitable structures within 100 feet of the toe of the slope downgradient of the recommended area. 5. The project does not involve denuding the project area of all vegetation. If the above conditions do not exist a geotechnical report shall be prepared. The geotechnical report shall: 1. Evaluate soil, slope, and other geologic hazard conditions 2. Commit to appropriate and comprehensive mitigation measures sufficient to reduce risks to acceptable levels, including post-construction site monitoring, if applicable, and 3. Address the impact of the project on adjacent lands, and potential impacts of offsite conditions ***BMP-Geologic Hazards-(new) Construction Performance Standards in Areas of Slides and Debris Flows -*** Ground disturbance areas of identified landslide and debris flow hazards shall be performed in a manner to avoid reactivation of landslides or decreasing slope stability.			
Hazards - Fire Hazards			
5.4-2 In order to reduce wildfire hazards impacts, the MCOSD shall adopt the following new best management practices:	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity*	Marin County Open Space District together with Marin County Fire Department plus

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
BMP-Fuel Management (new) Develop a preserve wildfire protection plan for each preserve using existing conditions. Such a plan shall include spatial data on existing hazards, factors influencing fire response and behavior, and natural resource values at risk. This plan shall be developed jointly between the appropriate fire agencies and the MCOSD. The preserve wildfire protection plan shall include an assessment of existing conditions and a site-specific fire behavior analysis and will recommend the components necessary to minimize risk of wildfire. Private landowners who live within the WUI will be included in the process. The plan will detail the steps to reduce wildland fire risk and fire hazard to structures, people, and natural resources, while still protecting important biological diversity within the preserves. The plan shall specify the location and dimensions and desired condition of needed access, treatments adjacent to structures, areas of defensible space on private property, and segments of the fuelbreak system. The fire behavior analysis shall use the best available fire spread model and include fire growth (and fire behavior characteristics) with and without treatments, and a site-specific comparative analysis of fire behavior characteristics with and without treatments. A variety of alternatives shall be analyzed. Because of limitations associated with all fire spread models, the analysis will combine the mode results with expert judgment and experience. The MCOSD will not restore or convert an existing fuelbreak without meeting the following requirements: Acceptance of a preserve wildfire protection plan that has been prepared jointly with the appropriate fire agency; and Restoration or conversion is done either concurrently with or after implementation of the plan improvements that ameliorate the fire protection in the area.		*Management Plan.*	relevant local fire departments would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
5.4-3 In order to minimize ignition risks activities related to the continued implementation of the VBMP revise **BMP-General-7** as follows: **BMP-GENERAL-7** *Include Standard Procedures in Construction Contract* The MCOSD will conduct a training program about ignition prevention and detection and fire reporting methods, and will include how to obtain weather information (available at www.preventwildfireca.org) and communication protocols. The training will be required for all employees and contractors using machinery that require a spark arrestor. All contractors will submit a statement of compliance that all motorized equipment have spark arrestors and comply with California Public Resources Code Section 4442, 4443 and 4428. The MCOSD will focus patrols by staff on areas of high ignition potential during period of Red Flag Warnings. Avoid cutting seedling oaks (have staff walk weed-whipping/mowing area first and flag the locations of seedling trees or shrubs). In limited areas where funding allows, plant or otherwise establish vegetation with low-ignitability. Keep the canopy of trees lower and mow the grass under the tree canopy to both encourage spread of young trees and prevent torching.	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.
Hazards - Herbicide Use			
5.5-1 In order to reduce impacts associated with herbicide use from activities related to the continued implementation of the VBMP, the MCOSD shall revise **BMP-Invasive Plant-2** as follows: **BMP-Invasive Plant-2-** *Limit Herbicide Use within 100 feet of sensitive natural resources.* Where possible, ensure use of least harmful method to conduct vegetation management	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for preparation of required treatment programs and for monitoring their implementation.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
(e.g. hand control, mechanical control, cultural controls). Where herbicide treatment within a minimum 100-foot buffer is considered essential to control the invasive species and reduce the threat to sensitive natural resources, the MCOSD will prepare a treatment program, as called for in **BMP-Sensitive Natural Resources-1** to ensure careful controls are fully implemented and conditions adequately monitored. Within the 100-foot buffer zone, herbicide use is limited through either: (a) avoiding the use of herbicide entirely within the zone, or (b) restricting herbicide to targeted application methods, such as foliar spot spray applications. Options on the extent, specific herbicide(s), and application method(s) will be reviewed in the treatment program, and recommendations made for preferred treatment based on site specific conditions, threats, and benefits to the sensitive natural resource, and latest adaptive management practices. This concept is illustrated in **Exhibit 5.5-7**. **Exhibit 5.5-8** is a decision tree which illustrates the general mitigation approach for Mitigation Measure 5.5-1 that may be followed to mitigate impact and evaluate whether an application should be performed or postponed.			
Air Quality / Greenhouse Gases			
5.6-1 In order to reduce impacts to air quality from activities related to the implementation of the VBMP, the MCOSD shall adopt the following new best management practices: **BMP-Air Quality-(new)** *Dust and Exhaust Control* - During any construction ground disturbance, implement measures to control dust and exhaust. Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality impacts associated with grading and new	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
construction to a less-than-significant. The contractors shall implement the following best management practices that are required of all construction projects: All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. All haul trucks transporting soil, sand, or other loose material off-site shall be covered. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. All vehicle speeds on unpaved roads shall be limited to 15 mph. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall			

Mitigation Measure	***Implemented by***	***When Implemented***	***Monitoring or Reporting Action***
also be visible to ensure compliance with applicable regulations.			
Cultural Resources			
5.9-1 In order to reduce impacts to cultural resources from activities related to the continued implementation of the VBMP the MCOSD shall adopt the following new best management practices. **BMP-Cultural Resources (new)** *Historical and Archaeological Resource Mapping* - Prior to vegetation management activities that involve ground disturbance MCOSD will physically evaluate the project area for likelihood of existence of Cultural Resources within the project site. The evaluation will include historically or archaeologically sensitive areas according to map 4-1 (Historical Resources) in the *Marin Countywide Plan* and/or identified as culturally sensitive on other confidential maps on file with the county that list prehistoric or archeological sites. If the project area is identified as sensitive on any of these maps, the site will be field surveyed by a state-qualified archeologist or an archeological consultant recommended by the federated Indians of Graton Rancherias, who would make recommendation and develop proposals for any procedures deemed necessary. **BMP-Cultural Resources (new)** *Construction Discovery Protocol* - In the event cultural resources are uncovered during any earthwork- pursuant to CEQA Guidelines 15064.5(f), "provisions for historical or unique archaeological resources accidentally discovered during construction" shall be instituted. In the event that any prehistoric or historic subsurface cultural resources are discovered during ground disturbing activities, all work within 100 feet of the resources shall be halted and MCOSD shall consult a qualified archaeologist/paleontologist to assess the significance of the	Marin County Open Space District.	Adopted as a part of the *Vegetation and Biodiversity Management Plan.*	Marin County Open Space District would be responsible for implementing and overseeing compliance with best management practice.

Mitigation Measure	*Implemented by*	*When Implemented*	*Monitoring or Reporting Action*
find (per Public Resources Code Section 5024.1, Title 14 California Code of Regulations, Section 4852 and/or Public Resources Code 21083.2 in the event of a unique archaeological find). If any find is determined to be significant and will be adversely affected by the project, representatives of MCOSD and the qualified archaeologist/paleontologist would meet to determine the appropriate avoidance measures or other appropriate mitigation (per CEQA Guidelines 15064.5(b) and Public Resources Code 21083.2). In the event that human skeletal remains are discovered anywhere in the preserves other than a dedicated cemetery, work in the vicinity of the discovery must be discontinued and the Marin County Coroner must be contacted. If skeletal remains are found to be prehistoric Native American (not modern), the Coroner will call the Native American Heritage Commission in Sacramento within 24 hours; they in turn will identify the person(s) believed to be the "Most Likely Descendant" of the deceased Native American. The Most Likely Descendant would be responsible for recommending the disposition and treatment of the remains. The Most Likely Descendant may make recommendations to MCOSD or the person responsible for the excavation work regarding the appropriate treatment and disposition of the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98. **BMP-Cultural Resources (new)** *Community Awareness* - The VBMP contains information about volunteer programs. Public outreach can include efforts to increase public awareness of local history and archeology, and the need to protect cultural resources. This may be accomplished by highlighting cultural resources along a road or trail with interpretive signs and information kiosks.			

APPENDIX B

MITIGATION MONITORING AND REPORTING PROGRAM

APPENDIX B
VEGETATION PROJECT DEVELOPMENT WORKSHEET
MARIN COUNTY OPEN SPACE DISTRICT
VEGETATION AND BIODIVERSITY MANAGEMENT PLAN

In developing the MMRP for this plan, the MCOSD recognized that the mitigation measures only address changes to the VBMP. Specifically, all of the mitigation took the form of changes to or new BMPs. The MMRP (see Appendix A) would only track the modifications to the plan to incorporate the new or revised BMPs. In order to track and report on projects, the MCOSD developed a draft project worksheet that identifies the proposed project and tracks its consistency with VBMP policies and the implementation of all BMPs. This appendix contains a draft of the project development worksheet. This worksheet is subject to revision by the MCOSD to aid in project development, ensure efficient, and effective administration, or to meet the differing needs to document compliance for the various classes of projects. The MCOSD will complete this form (or its revised version) for every project requiring an initial study, negative declaration, mitigated negative declaration, or EIR. The MCOSD will not use this form for project that are otherwise exempt from CEQA.

Vegetation Project Development Worksheet

Project Name:	Click here to enter text.
Type of Project:	☐ Fuel Reduction ☐ Invasive Plant
	☐ Restoration ☐ Forest Health
	☐ Climate Change
Preserve Name:	Click here to enter text.
Lat/Long	Click here to enter text.
Project Footprint Area	Click here to enter text. (ft^2)
Project Start Date:	Click here to enter a date.
Project Completion Date:	Click here to enter a date.
Project Contractor:	Click here to enter text.
Project Manager:	Click here to enter text.
Vegetation Zone	
Legacy:	Click here to enter text. (ft^2)
Sustainable Natural Systems:	Click here to enter text. (ft^2)
Natural Landscape	Click here to enter text. (ft^2)
Highly Disturbed	Click here to enter text. (ft^2)

VBMP POLICY IMPLEMENTATION[108]	**Not Applicable**	**Implements Policy**	**To be implemented at subsequent project phase**	**Comments/ Proof of Compliance**
Comprehensive-1 – Emphasize High Value Resources	☐	☐	☐	Click here to enter text.
Comprehensive-2 – Use Management Objectives	☐	☐	☐	Click here to enter text.
Comprehensive-3 – Manage Vegetation Threats	☐	☐	☐	Click here to enter text.
Comprehensive-4 – Use Best Available Science	☐	☐	☐	Click here to enter text.
Prioritization-2 – Emphasize Highest Biological Value	☐	☐	☐	Click here to enter text.
Prioritization-3 – Consider Timing	☐	☐	☐	Click here to enter text.
Inventory-1 – Monitoring	☐	☐	☐	Click here to enter text.
Natural Resources-1 – Protect High-Value Resources	☐	☐	☐	Click here to enter text.
Natural Resources-3 – Protect Core Areas and Wildlife Connectivity	☐	☐	☐	Click here to enter text.
Natural Resources-4 – Project Timing	☐	☐	☐	Click here to enter text.
Natural Resources-6 – Restoration	☐	☐	☐	Click here to enter text.

[108] Policy titles only listed in this table; refer to Final EIR, *Framework for Vegetation and Biodiversity Management, for a complete description of the policies*. The policies listed here are only those policies that apply to specific projects.

VBMP POLICY IMPLEMENTATION[108]	Not Applicable	Implements Policy	To be implemented at subsequent project phase	Comments/ Proof of Compliance
Natural Resources-7 – Wildlife Corridors	☐	☐	☐	Click here to enter text.
Invasive-1 – Spread of Weeds	☐	☐	☐	Click here to enter text.
Invasive-2 – Pioneer Infestation	☐	☐	☐	Click here to enter text.
Invasive-3 – IPM	☐	☐	☐	Click here to enter text.
Fire-1 – Defensible Space	☐	☐	☐	Click here to enter text.
Fire-5 – High Fire Periods	☐	☐	☐	Click here to enter text.
Fire-6 – Prioritize fuel Modification Zones	☐	☐	☐	Click here to enter text.
Fire-8 – Treatment Plans	☐	☐	☐	Click here to enter text.
Fire-9 – Non-Essential Fuel Breaks	☐	☐	☐	Click here to enter text.
Fire-11 – Fire Rehabilitation	☐	☐	☐	Click here to enter text.
Forest-1 – Diseased Tree Hazards	☐	☐	☐	Click here to enter text.
Forest-2 – Forest Pathogens	☐	☐	☐	Click here to enter text.
Forest-4 – Regional Efforts	☐	☐	☐	Click here to enter text.
Forest-5 – Non-Native Trees	☐	☐	☐	Click here to enter text.
Forest-6 – Douglas Firs	☐	☐	☐	Click here to enter text.
Forest-7 – Low Use Areas	☐	☐	☐	Click here to enter text.
Climate-1 – Greenhouse Gasses	☐	☐	☐	Click here to enter text.

VBMP POLICY IMPLEMENTATION[108]	**Not Applicable**	**Implements Policy**	**To be implemented at subsequent project phase**	**Comments/ Proof of Compliance**
Climate-3 – Climate Change Response	☐	☐	☐	Click here to enter text.
Climate-4 – Wetland Loss	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
7.1 General BMPs						
General-1 Limit Work Area Footprints in Sensitive Areas	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-2 Modify Vegetation Management Methods in and near Wetlands, Riparian Vegetation	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-3 Minimize Potential for Erosion	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-4 Control-Food Related Trash	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-5 Modify Construction Methods Relating to Soil Disturbance, Restrict Use of Offsite Soil, Aggregate, or Other Construction Materials	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-6 Prevent or Reduce Potential for Pollution	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-7 Include Standard Procedures in Construction Contracts	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

[109] Best Management Practices titles only listed in this table; refer to VBMP Chapter 7, *Best Management Practices*, and Tables 7.1 through 7.11 for the detailed requirements for each BMP.

[110] Timing: (PPD) During project planning and design; (PrC) Prior to construction; (DC) During construction; (PoC) Post construction; (PPoc) Periodically post construction. Also, if there are seasonal or other timing constraints on implementation of a BMP, note here.

[111] Number of times BMP needs to be repeated or resurveyed

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
General-8 Control Noise	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
General-9 Conduct Worker Training	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
7.2 Sensitive Natural Resources BMPs						
Sensitive Natural Resources-1 Modify Management Practices near Sensitive Natural Resources	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
7.3 Special Status Wildlife BMPs						
Special-Status Wildlife Species-1 Seasonal Restrictions during the bird nesting season	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Wildlife-2 Avoidance and Protection of Northern Spotted Owl	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Wildlife-3 Avoidance and Protection of Double-Crested Cormorant Nests and Heron and Egret Rookery Sites	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Wildlife-6 Avoidance and Protection of Ridgway's Rail, California Black Rail, and Salt Marsh Harvest Mouse	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Wildlife-5 Literature Reviews	Choose an item.	Choose an item.	☐	☐	☐	
Special-Status Wildlife-6 Preconstruction Surveys	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
7.4 Special Status Plants BMPs						
Special-Status Plants-1 Avoid and Protect of Special-Status Plants near Vegetation Management Projects	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Plants-2 Ensure Proposed Actions Are Consistent with Ongoing Programs	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Plants-3 Use Native Soils Where Earthwork Occurs near Special-Status Plant Populations	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Plants-4 Limit Erosion Potential near Special-Status Plants	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Plants-5 Use Locally Collected and Weed-Free Plant Materials for Restoration in and near Special-Status Plant Populations	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Special-Status Plants-6 Literature Reviews	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
7.5 Invasive Plants BMPs						
Invasive Plants-1 Implement an Integrated Pest Management (IPM) Approach with Herbicide Application, Notification, and Signage Procedures	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
Invasive Plants-2 Limit Herbicide Use near Sensitive Natural Resources	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants-3 Survey and Control Invasive Plants in Project Footprint, Including Access Roads and Staging Areas	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants-4 Limited Soil Disturbance	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants—5 Clean Invasive Plant Materials and Propagules from Heavy Equipment, Maintenance Tools, and Fire Management Vehicles	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants-6 Reducing Potential for Establishment of Invasive Plants on Disturbed Soil Surfaces	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants-7 Monitor and Control of Invasive Plants Management Work Areas	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plant-8 Restrict Use of Invasive Plants for Horticultural Use	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Invasive Plants-9 Protection of Streambanks and Water Quality During Invasive Plant Removal	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
7.6 Fire Fuel Management and Risk Reduction BMPs						
Fuel Management-1 Process Green Waste To Reduce Risk of Ignition	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-2 Use of Herbicide During Fuel Management	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-3 Treat Existing Brush Piles during Fuel Management	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-4 Develop plans for Managing Fuels Within Special-Status Plant Populations	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-5 Develop Restoration Plans in Conjunction with Fuel Management	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-6 Protect Nesting Birds During Fuel Management	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-7 Monitor and Remove Invasive Plants	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-8 Reduce Potential for Spread of Invasive Plants During Fuel Management	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
Fuel Management-9 Conform with Federal and State Regulations Governing Sudden Oak Death, Implement Procedures to Contain the Spread of SOD	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-10 Follow Procedures for Take of Listed Species during Emergency Fire Management Actions	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-11 Seek to Adhere to No Net Loss of Listed Species from Fire Management Activities	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-12 Limit Work in Wetlands During Emergency Fire Management Actions	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Fuel Management-13 Work with County Fire, local fire agencies, and Private Property Owners if Encroachment onto MCOSD Preserves is Necessary to Meet Defensible Space Zone Requirements	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
7.6 Ongoing Maintenance BMPs						
Maintenance-1 Implement General BMPs (BMP-General-1 through BMP-General-9)	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.

BEST MANAGEMENT PRACTICES[109]	Timing[110]	Repetition[111]	Not Applicable	In Process	Complete	Comments/ Proof of Compliance
Maintenance-2 Implement sensitive natural resource restrictions when working in known special status species habitats (implement BMP-Special-Status Wildlife Species and BMP-Special-Status Plants-1).	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Maintenance-3 Implement Bird Nesting Restrictions for vegetation removal projects (BMP special-Status wildlife species-1)	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Maintenance-4 Implement BMP-INVASIVE Plant-1 through BMP-Invasive Plant-9 for all maintenance activities in and near invasive plant infestations.	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.
Maintenance-5 Implement BMP-Fuel Management-1 through BMP-Fuel Management-5 for all fuel maintenance projects. Implement BMP-Fuel Management-9 and BMP-Fuel Management-13 as applicable.	Choose an item.	Choose an item.	☐	☐	☐	Click here to enter text.