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SUPERIOR COURT OF THE STATE OF CALIFORNIA
IN AND FOR THE COUNTY OF HUMBOLDT

TRISHA LEE LOTUS; et al.

CASE NO CV 110002

Petitioners,
v.

DECLARATION OF JOE R.
MCBRIDE IN SUPPORT OF
PETITIONERS' REQUEST FOR
INJUNCTIVE RELIEF

STATE OF CALIFORNIA DEPARTMENT OF
TRANSPORTATION, et al.,

Respondents.

DATE: March 14, 2012
TIME: 9:00 a.m.
COURTROOM: 8 (Hon. Dale A.
Reinholtzen

Action Filed: June 17, 2010

FILED

DEC 09 2011

SUPERIOR COURT OF CALIFORNIA
COUNTY OF HUMBOLDT

Carolyn F.

1 I, JOE R. McBRIDE, declare as follows:

2 1. I am a consulting professional forester, California License No. 1306 and am a
3 Professor of Forestry and Landscape Architecture at the University of California, Berkeley. My
4 professional qualifications are discussed in more detail herein and a true and correct copy of my
5 current resume is attached hereto as **Exhibit 1**. I make this declaration based on my personal
6 knowledge, expertise, experience, and the materials and activities described herein and in
7 **Exhibit 2** attached hereto, and if called as a witness, I would and could testify to the following:

8 **I. INTRODUCTION**

9 2. The following declaration presents the results of my analysis of the impacts of
10 proposed modifications of Highway 101 by the California Department of Transportation
11 ("Caltrans") through an old growth redwood stand in area including Richardson Grove State
12 Park (the "Project"). My analysis is based on a review of pertinent documents (see list attached
13 hereto as **Exhibit 2**), a site reconnaissance, and my experience and expertise in the field of
14 redwood forest ecology and impact evaluation. This report was prepared in response to a request
15 by the Plaintiffs in the above captioned action to conduct an analysis of the potential impact of
16 the Project. The site reconnaissance upon which this report is based took place on April 9, 2011
17 and is described below.

18 **II. PROFESSIONAL QUALIFICATIONS**

19 3. I am a registered professional forester in California (license #1306), Fellow of the
20 Society of American Foresters, Charter Member of the California Association of Environmental
21 Professionals, member of the International Society of Arboriculture and a recipient of the
22 Research Award of the International Society of Arboriculture.

23 4. My education includes a B.S. in Forestry from the University of Montana, M.S.
24 (Forestry) and Ph.D. (Botany) degrees from the University of California, Berkeley.

25 5. I am, and have been for 42 years and 41 years, respectively a Professor of
26 Forestry and Landscape Architecture at the University of California, Berkeley. As a professor of
27 forestry, for 42 years I have instructed graduate and undergraduate students in forest ecology,
28 which includes tree physiology and human impacts thereon. I teach courses in forest ecology,

1 forest operations management, urban forestry, and ecological analysis. Among the forest
2 ecology courses I have taught is a course in physiological ecology that examines physiological
3 processes in trees in relation to the environment. Because of the relevance of the redwood tree to
4 forestry in California, many aspects of this course dealt with the physiology of the redwood. In
5 the forest operations management course I teach much attention is paid to forest road
6 construction, the installation and replacement of culverts, and the impacts of heavy equipment on
7 forest soils. A large section of the urban forestry course I teach is focused on arboriculture, in
8 particular the response of trees to the stresses of the urban environment. The ecological analysis
9 course is concerned with the analysis of natural factors (including soils) from the standpoint of
10 plant growth for landscape architects.

11 6. I have published over 292 scientific articles and reports, including 35
12 environmental impact reports focused on impacts to vegetation and 46 vegetation management
13 plans. Of these 81 reports, 15 concerned properties supporting redwood forests. These reports
14 were prepared for private land owners, private companies, homeowners associations,
15 conservation organizations, environmental consulting firms, County Planning Departments, City
16 Planning Departments, , California State Department of Parks and Recreation, Golden Gate
17 National Park Conservancy, Presidio Trust, U.S. National Parks Service, U.S. Army, and U.S.
18 Attorney General's Office. Of the 211 scientific articles I have published, 17 concerned redwood
19 trees and redwood forests. Among these was an annotated bibliography of the human impacts to
20 redwoods in California Parks. To be qualified to author the articles and reports I have authored
21 concerning subjects related to tree physiology and human effects thereon, I was required to have
22 expert knowledge concerning these subjects. More specifically, for dozens of articles and
23 reports that I have written concerning redwoods, I was required to have expert knowledge
24 specifically concerning redwood physiology and human impacts thereon.

25 **III. STATEMENT OF MY ASSIGNMENT REGARDING**

26 **RICHARDSON GROVE STATE PARK**

27 7. I was requested to conduct an evaluation of the potential impacts of the Project to
28 the trees and overall health of the forest along Highway 101 in the Project area and particularly

1 in Richardson Grove State Park. I was asked to look at the potential impacts resulting from the
2 proposed changes in road alignment and associated proposed actions including cut and fill of
3 soil, culvert work, and tree removal. My assessment of these actions focused, in particular, on
4 the manner in which these action would impact trees by severing both structural and feeder roots,
5 block the movement of oxygen and carbon dioxide into and out of the soil, and change patterns
6 of wind movement and light within the forest stands.

7 8. I reviewed reports and reviews on the road realignment project, including, in
8 particular, the Environmental Impact Report/Environmental Assessment and Programmatic
9 Section 4(f) Evaluation and Finding of No Significant Impact (“EIR”) and its appendices. After
10 a review of these documents I determined it was essential to visit the site in order to examine the
11 trees identified for removal and trees within areas designated for soil cutting and filling along the
12 highway in the Project area. I write this declaration based on my review of the documents listed
13 in Exhibit 2, the site visit, my expertise and experience.

14 **IV. ASPECTS OF REDWOOD PHYSIOLOGY AND ECOLOGY RELEVANT TO THE**
15 **PROPER ASSESSMENT OF THE PROJECT'S IMPACT**

16 9. The redwood forest extends along the coast of California in areas where summer
17 fog occurs. At some locations, summer fog moves inland along river courses and provides
18 environments that support redwoods. Coastal fog is necessary to reduce summer temperatures,
19 increase soil moisture, and prevent desiccation (the drying of redwood foliage and small
20 branches). The redwood forest is noted in the summer for the condensation of fog on limbs and
21 branches of the redwood trees that drips down to the forest floor contributing to the maintenance
22 of soil moisture in the season that is without rainfall. Fog water that condenses on the foliage of
23 redwood will be absorbed, thus reducing the need for water from the soil. Fog also reduces the
24 loss of water via transpiration from the foliage by decreasing the water potential gradient
25 between the leaves and the surrounding atmosphere.

26 10. Redwoods are noted for their relatively shallow, platform root systems that
27 provide structural support. The feeder roots that absorb both oxygen, water, and mineral
28 nutrients are also found very close to the soil surface. Compaction of the soil results in the

1 elimination of soil pore space that is critical to both water movement and the exchange of
2 oxygen and carbon dioxide in the soil. Oxygen must enter the soil from the atmosphere above
3 the ground and pass through the pore space to reach the roots. Carbon dioxide which is
4 produced by respiration of the roots exits the soil through the same soil pore network. When soil
5 pore network is destroyed by compaction or the soil is buried by compacted fill, the roots are
6 deprived of oxygen and the carbon dioxide produced by root respiration is trapped. These
7 conditions result in anaerobic respiration and the acidification of the soil as carbon dioxide forms
8 carbonic acid around the roots. Under these conditions root mortality can take place. Root
9 mortality, in turn, leads to a reduction in the trees capacity to absorb of oxygen, water, and soil
10 nutrients. This can result in the decline in the health and vigor of the tree as well as the
11 structural support the tree gets from its root system, leading to wind throw.

12 11. Soil pore space is also important to the downward movement of moisture derived
13 from fog drip in the summer. Compacted soil and soils covered with layers of fill compromises
14 the value of fog drip to the tree. The pore network in the soil primarily delivers water and
15 oxygen in a downward direction from the atmosphere above the ground and rain and fog drip
16 fallen on the soils surface. Horizontal transport of water, with the exception of soil adjacent to
17 streams is very limited. Oxygen may move horizontally in the soil depending on the horizontal
18 connectivity of the pore space, but in most cases oxygen moves vertically down into the soil
19 following the pores that deliver water to the roots. The destruction of the pore space in redwood
20 forest soils associated with soil compaction in redwood parks results in a reduction of radial
21 growth of redwoods and the dying back of the tops of trees. This phenomenon was first report
22 by Meinecke in 1929. Zinke (1962), Sturgeon (1964), and Standish (1972) have also reported on
23 the negative impacts of soil compaction to the health and growth of redwood trees.

24 12. Stone and Vasey (1968) observed that redwood trees will send up vertical roots
25 when their roots are buried by silt deposits resulting from the flooding of stream flat stands of
26 redwood. Zinke (1964) pointed out the growth of new platform roots when the base of redwood
27 trees are buried in natural silt deposits. It should be pointed out that the material described in
28 these studies was not compacted fill soil, nor soil of a clay texture. This root growth phenomena

1 would not occur in compacted fill used in highway construction because of the absence of a
2 network of pores in the compacted material.

3 13. The shallow platform structural roots of redwood trees make trees subject to wind
4 throw when portions of a trees root system are cut or broken. Meinecke (1929), Zinke (1962),
5 Sturgeon (1964), and Standish (1972) all report on the negative impacts of road building on
6 redwood trees. Hartesveldt (1963) reported similar impacts associated with road building in the
7 giant sequoia forests in Yosemite National Park. Giant sequoias have shallow platform root
8 systems similar to those of redwood trees. The impacts reported in all of these studies included
9 the severing and breaking of structural roots, soil compaction, and the exposure of trees to
10 increased light intensity, crown temperatures, and wind which has resulted in tree failure. "Tree
11 failure" is the technical term for a tree losing its structural support and falling under its own
12 weight or being thrown by the wind.

13 14. To assess the potential for the above described impacts to occur in a redwood
14 stand as the result of roadwork that includes soil cutting and filling in the vicinity of large old
15 growth redwoods, cutting of structural roots, soil compaction, and increased exposure of tree
16 canopies to wind, one must examine each tree and make conclusions about the site specific
17 impacts each tree will suffer. A tree by tree analysis of all trees in the area of potential impact is
18 required.

19 **V. STATEMENT OF MY ACTIVITIES**

20 **A. Documents Reviewed.**

21 15. Prior to and after the site visit I reviewed the documents listed **Exhibit 2** attached
22 hereto. Special attention was paid to the EIR and the report of the Caltrans' and
23 Save-the-Redwoods League' arborists. Portions of the other documents that concerned the
24 potential impact of the project on trees and tree roots were also studied.

25 **B. Site Visit.**

26 16. On April 9, 2011 I visited the Project site and examined the trees along the
27 portion of highway 101 proposed for realignment in Richardson Grove State Park. Using the
28 maps in the EIR (Appendix L. Layout Maps - Richardson Grove Operational Improvement

1 Project - Caltrans), I located each tree identified by Caltrans in Appendix L as potentially
2 impacted by the Project, initially working from north to south along the east side of the highway,
3 then in the opposite direction along the west side of the highway. In doing so I identified
4 additional trees that were growing in the impact zone that were not shown on the Caltrans map
5 and which were shown on the Caltrans map but which were not identified as impacted, but which
6 in my opinion would be impacted. I walked around each mapped and unmapped tree to examine
7 its base and to understand the approximate depth of fill and location of cutting that was
8 proposed. I also examined each tree that was to be cut down to evaluate the impact of their
9 removal on the forest and adjacent trees. I also took notice of culverts that were identified for
10 repair or replacement and the impact of road realignment and the effect faster moving trucks
11 would have on wind velocities along the highway. I measured trees that I examined using a
12 diameter tape for trees under 20' in circumference and with a 100' tape for larger trees. The
13 diameter of a tree and, in particular, a redwood tree is relevant to determining the impact of
14 proposed soil cutting and filling in the vicinity of the tree because structural roots generally
15 extend out a distance of three times the diameter of the tree.

16 **C. Table of Tree Impacts.**

17 17. During my field observations, as I examined each tree, I recorded my
18 observations for each tree. I then consolidated those observations in **Table A**. **Table A** reflects
19 my assessment of the impacts to the individual trees based on my field observations and the
20 information from the EIR regarding the depth of fill and the location of soil cutting around and
21 adjacent to each tree. A true and correct copy of **Table A** is attached hereto as **Exhibit 3**.

22 18. I recorded notes about each tree based on an individual examination of each tree.
23 My assessment of the impacts to the trees was based on my field observations and the
24 information regarding the depth of fill and the location of the proposed cutting of the soil around
25 and adjacent to each tree described in the EIR. This assessment is shown in attached **Table A** as
26 **Exhibit 3**. I also mapped each tree, by number, using those numbers which correspond to my
27 **Table A** at **Exhibit 3**. A true and correct copy of this mapping is attached hereto as **Exhibit 4**.

1 **VI. MY OPINION OF PROJECT'S IMPACTS**

2 19. The redwood forest in Richardson Grove State Park supports old growth stands of
3 redwood that are an important part of California's natural heritage. This heritage has nearly
4 disappeared as a result of logging and conversion to agriculture of the original redwood forest.
5 Of the close to 2,000,000 acres of redwood forest in California in 1850, only about 39,000 acres
6 are protected in state and national parks. These old growth stands cannot be replaced and special
7 consideration should be given to any projects that would impact the remaining old growth
8 forests.

9 20. **Table A** attached hereto as **Exhibit 3** presents the results of my tree-by-tree
10 analysis of the impact of the Project of the 108 trees I have identified in the impact zone of the
11 Project. The sections below summarize these results by category of impacts.

12 **A. Impacts from Proposed Soil Cutting and Fill.**

13 21. Based on my review of the materials listed in **Exhibit 2**, my site visit, my
14 expertise and my experience, it is my opinion that the trees in the vicinity of the Project would
15 be negatively impacted by soil cutting and filling. The severity of this impact would depend
16 upon the depth of soil cutting and filling in relation to the distance from the tree. These activities
17 would result in a decrease in both structural and feeder roots of the trees in locations where
18 cutting takes place and a decrease in soil moisture and oxygen in the areas of fill. This would, in
19 turn, cause a decrease in the trees capacity to absorb water, oxygen, and soil nutrients as well as
20 the severing of structural roots that support the tree.

21 22. The terms “feeder roots” or “fibrous roots” are commonly used to describe small,
22 fibrous roots, in contrast with the terms “woody roots” or “large roots,” which are used to refer
23 to larger more woody roots. Roots transition from fibrous or feeder roots to woody or larger
24 roots at approximately 1/8 inch in diameter.

25 23. These phenomena are know to result in both significant reductions in the health
26 and vigor of affected redwoods as well as the death of such trees from toppling or “tree failure,”
27 as it is technically referred to. In this regard, it is important to note that redwoods live for a very
28 long time, exceeding the life expectancy of most other tree species. Moreover, redwoods have

1 very few natural pest enemies. In most cases the demise of a redwood is understood as being
2 almost always caused by external factors, particularly loss of structural support as a result of
3 damage to its root system, which in interaction with wind can cause the tree to topple over and
4 die, and/or factors that prevent the tree from gaining sufficient water, oxygen, and/or soil
5 nutrients.

6 24. Of the 108 trees that I identified in the impact zone of the Project, my
7 examination identified 37 trees (numbers 6, 7, 9, 11, 12, 14, 15, 16, 17, 22, 23, 24, 29, 32, 38, 47,
8 55, 57, 63, 68, 69, 74, 75, 76, 77, 78, 82, 84, 85, 86, 87, 91, 93, 95, 96, 97 on **Table A (Exhibit**
9 **3)** that would be severely impacted in their vicinities by soil cuts 12" and greater and/or fill 12"
10 and greater. In the case of some of these trees the Project calls for both soil cutting and filling to
11 occur in their vicinities, resulting in a double impact of both soil cutting and filling in the zone of
12 their structural roots. This would cause the loss of structural support on the side of the tree that
13 soil cutting took place. Soil cutting would also severe feeder roots necessary for tree nutrition,
14 leading to a decline in the health and vigor of the tree. The fill would also interfere with the
15 movement of oxygen and water into the soil, that is necessary for the metabolism of the root
16 system.

17 25. The severe impacts to these trees from soiling cutting and or filling in their
18 vicinities are likely to include the deaths or "failures" of particular trees.

19 26. These trees include a giant ancient redwood with a diameter at breast height
20 ("DBH") of 216" or 18' (tree No. 9), a giant ancient redwood with a DBH of 120" or 10' (tree
21 No. 11), a giant ancient redwood with a DBH of 132" or 11' (tree No. 22), a giant ancient
22 redwood with a DBH of 115" or 9.6' (tree No. 38), a giant ancient redwood with a DBH of 132"
23 or 11' (tree No. 75), a giant ancient redwood with a DBH of 136" or 11.3' (tree No. 76), a giant
24 ancient redwood with a DBH of 144" or 12' (tree No. 84), and a giant ancient redwood with a
25 DBH of 120" or 10' (tree No. 96).

26 27. Moreover, most of these trees occur in groups where adjacent trees would be
27 severely impacted (e.g., trees numbered 11 through 17, trees numbered 74 to 78, trees numbered
28 84 to 87, on **Table A (Exhibit 3)**). The demise of these trees as a result of soil cutting and filling

1 would create openings in the forest where increased temperature and wind velocity would stress
2 adjacent trees, potentially causing more tree failures, as a result of the drying out of the upper
3 portions of the tree canopies and more wind pressure on the trees adjacent to the openings.
4 These severe impacts are likely to include the deaths or “failures” of particular trees that the
5 proposed soil cutting and filling would cause and the knock-on effects that the demise of these
6 trees would have on other redwoods in their vicinities.

7 **B. Impacts from culvert work and Proposed Irrigation Minimization Measures.**

8 28. Trees adjacent to culverts that are to be replaced or modified would suffer loss of
9 both structural and feeder roots. It would not be possible to remove existing culverts without
10 removing some feeder roots and in some cases structural roots, regardless whether an air spade
11 would be used as has been proposed. Feeder roots may not be cut by an air spade, but the finer
12 roots easily dry out and die before the areas adjacent to the new culvert can be refilled by soil.
13 The soil around culverts must be compacted in order that the culvert stays in place and the road
14 over the culvert does not collapse. This necessary procedure would destroy the pore space in the
15 soil. Tree numbers 2, 38, 48, 51, 59, 61, and 65 on **Table A (Exhibit 3)** can be expected to be
16 negatively impacted due to their proximity to existing culvert that would be replaced or
17 modified, resulting in decreased tree nutrition and die back of the root systems. These trees
18 include a giant ancient redwood with a DBH of 115" or 9.6' (tree No. 38).

19
20 29. As to Caltrans’ proposed minimization measures including irrigation of the roots,
21 it is my opinion that these minimization methods would not be effective and, in fact, are likely to
22 negatively affect the health of redwoods in the areas where these methods are used.

23 30. As to the proposed irrigation in the root zones, in particular, I am concerned with
24 the potential summer irrigation might have on the oxygen supply in the root zone. On
25 well-drained soil, irrigation water quickly percolated down through the soil profile allowing for
26 air to move into the soil from the atmosphere. If compaction of the soil takes place during soil
27 filling and/or the replacement of culverts, which I believe would occur as a result of proposed
28

1 Project activities, easy percolation of irrigation water will not occur. This would result in water
2 logged soils and that can present serious problems for root respiration in the summer time. Soil
3 saturation of redwoods in the winter is not so much a problem as the metabolism of the trees is
4 shut down. The situation is different during the summer months when the root system needs
5 oxygen for nutrient uptake and root respiration. Thus, I believe that the use of irrigation in the
6 manner proposed by Caltrans would have adverse, rather than ameliorative, effects on the
7 redwoods.

8
9 **C. Impacts from Increased Wind Velocities.**

10 31. In addition to the trees that would be impacted by soil cutting, filling, and culvert
11 replacement and repairs, I have identified 35 trees that would experience increased wind
12 velocities in their vicinities and related desiccation as a result of the road realignment project.
13 This, in combination with the reduction in soil moisture due to soil compaction and the cutting of
14 the feeder roots, described above, would result in the death of the tops of the trees and can lead
15 to tree failure as pointed out in the reports cited above. These include tree numbers 2, 4, 5, 6, 10,
16 11, 13, 14, 16, 21, 25, 26, 36, 38, 46, 47, 56, 57, 59, 62, 63, 64, 68, 69, 77, 78, 85, 89, 90, 91, 94,
17 99, 100, 102, and 104 on **Table A** at **Exhibit 3**.

18 32. The thirty-five trees that would be impacted in this way include a giant ancient
19 redwood with a DBH of 120" or 10' (tree No. 11), a giant ancient redwood with a DBH of 156"
20 or 13' (tree No. 21), a giant ancient redwood with a DBH of 115" or 9.6' (tree No. 38), a giant
21 ancient redwood with a DBH of 180" or 15' (tree No. 62), a giant ancient redwood with a DBH
22 of 132" or 11' (tree No. 69), a giant ancient redwood with a DBH of 120" or 10' (tree No. 99),
23 and a giant ancient redwood with a DBH of 108" or 9' (tree No. 100).

24 33. Several elements would increase wind velocity in the vicinity of these trees,
25 including the planned removal by Caltrans of fifty-four (54) small trees that presently act as
26 wind buffers (see below), the "demise" of other trees that presently act as buffers in their
27 vicinities as a result of the proposed soil cutting and filling in their vicinities, the increased wind
28

1 velocities caused by increased number of large trucks moving through the grove (which I
2 understand is the goal of the Project) and the increase of speed of vehicles traveling through the
3 Grove, which I believe would be a likely result of Caltrans' planned road realignments.

4 **D. Impacts from Removal of 54 Trees.**

5 34. Further impact from the Project would be caused to trees in the Project area by
6 the removal of 54 trees. The EIR attempts to dismiss these trees because they are for the most
7 part tanoak, Douglas-fir or redwoods of small diameters. However, these trees play an important
8 role in the redwood forest ecosystem. They provide nesting cover and food for wildlife species
9 that are not provided by redwood trees. The small redwoods that would be cut are also potential
10 recruits for canopy trees in the forest.
11

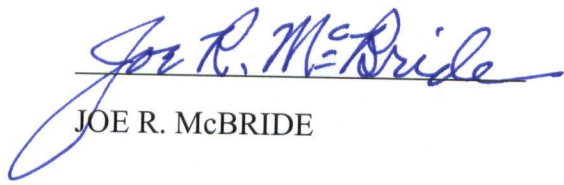
12 35. The impact of the cutting of these trees should also not be dismissed since it can
13 cause a domino effect of desiccation and tree failure along the margins of openings in the forest
14 canopy. The ultimate loss of trees would be greater than the number removed in the project due
15 to these negative indirect effects on adjacent trees.

16 **VII. CONCLUSION**

17 36. The importance of this old growth redwood stand, in view of the important
18 heritage of the redwood forest, requires special consideration before projects that would impact
19 the stand are allowed to go forward. The redwoods of Richardson Grove represent some of the
20 last standing giant ancient redwoods in the world. Several of these redwoods are very large, and,
21 thus it reasonable to assume that they are very old. They are, therefore, irreplaceable: once
22 destroyed they are gone and will not be replaced by equivalent trees from millennia.

23 Based on my background and experience, training, expertise, review of relevant documents
24 including the materials listed in **Exhibit 2**, and my examination of the Project site and individual
25 trees in the Project area, it is my unqualified opinion that the Project would cause substantial,
26 irreparable damage to the trees in the Project area. It is my opinion that this would, in turn,
27 cause negative impacts to the overall health of the forest in the vicinity of the Project area.
28

1 I declare under penalty of perjury that the foregoing statements are true and correct and
2 that this declaration was executed on December 7, 2011 in Berkeley, California.
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6 JOE R. McBRIDE
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