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7
8 SUPERIOR COURT OF THE STATE OF CALIFORNIA
9 COUNTY OF LOS ANGELES

10
11 Coordination Proceeding
Special Title (Rule 1550(b))

Judicial Council Coordination
Proceeding No. 4408

12 ANTELOPE VALLEY GROUNDWATER
13 CASES

AMENDED SUPPLEMENTAL
DECLARATION OF BRUCE N.
NELSON, P.E. FOR HEARING ON
JURISDICTIONAL BOUNDARIES
(U.S. BORAX)

14 Included Actions:

[Amended to Provide a Higher
Resolution Copy of Exhibit A]

15 Los Angeles County Waterworks District
No. 40 v. Diamond Farming Co.
16 Superior Court of California,
County of Los Angeles, Case No. BC 325 201

Dept: 1

17 Los Angeles County Waterworks District
18 No. 40 v. Diamond Farming Co.
Superior Court of California,
19 County of Kern, Case No. S-1500-CV-254-348

20 Wm. Bolthouse Farms, Inc. v. City of
Lancaster
21 Diamond Farming Co. v. City of Lancaster
Diamond Farming Co. v. Palmdale Water Dist.
22 Superior Court of California, County of
Riverside, consolidated actions, Case
23 Nos. RIC 353 840, RIC 344 436, RIC 344 668

24
25 **NOTE:**

*This Amended Supplemental Declaration is being submitted for the sole purpose of
providing a higher resolution copy of the map attached as Exhibit A to the*

*Supplemental Declaration of Bruce N. Nelson —
“North Muroc Basin Potentiometric Contour Map 2006 –
Rio Tinto Minerals – Boron Operations.”
Nothing else has been changed.*

1 I, BRUCE N. NELSON, declare as follows:

2 1. I am a consultant and have served as an expert in groundwater hydrology and
3 engineering hydrology. I have been retained in this matter to provide technical assistance with
4 surface and groundwater hydrology, including assessment of the groundwater supply at U.S. Borax's
5 operations in Boron, California.

6 2. I am a Registered Professional Engineer (#11710) nationally via the National Council
7 of Engineering Examiners, and individually registered in six western states for the past 21 years. I
8 am currently a licensed monitoring well constructor, and a member of the Association of
9 Groundwater Scientists and Engineers, a division of the American Water Well Association. My
10 education includes a Master of Science degree from Montana State University in Civil/Environmental
11 Engineering, specializing in water resources engineering, with a minor in chemistry. My work
12 experience in the field of hydrology and water resources engineering covers the past 24 years, most
13 of which has been in applied hydrology in the industrial sector.

14 **Purpose and Background**

15 3. This declaration is being provided in-lieu of presentation of testimony during the
16 proceedings of October 10-12, 2006. This declaration addresses the pending Court establishment of
17 administrative boundaries to define the extent of the "Antelope Valley Groundwater Adjudication" in
18 southern California. Specifically, this declaration discusses the northeast area of the Antelope Valley
19 Groundwater Basin (AVGB), commonly referred to as the North Muroc area. Several experts have
20 submitted declarations and provided testimony that propose a boundary in the North Muroc area.
21 Though most of these proposals are similar or identical to the boundary proposed in our July 24, 2006
22 declaration, a few are not. This declaration is provided to address the differences in the proposed
23 boundary for the Muroc area and technical support for the boundary as proposed in the U.S. Borax
24 declaration of July 24, 2006.

25 4. As an aid to discussion, attached hereto as **Exhibit A**, is a map of the Muroc and
26 adjacent area. This map is based upon Geographical Information Systems (GIS) data and base map,
27 dated May, 2006, obtained from the California Department of Water Resources (DWR). The map
28 also depicts significant cultural features and legal boundaries such as the Public Land Survey (PLS).

1 The map also shows the Antelope Valley Adjudication area as proposed in this declaration for the
2 North Muroc area.

3 **Basic Hydrogeologic Regime**

4 5. Investigations conducted by the U.S. Geological Survey and others indicate that the
5 North Muroc Basin is a sub-basin of the greater AVGB and is contained within the Antelope Valley
6 surface watershed (C.E. Lamb, 1980; Leighton et. al, 2003). It is also generally agreed by several
7 hydrogeologic investigations that consolidated rock within the drainage basin, including volcanic,
8 igneous and metamorphic crystalline rock, and consolidated sedimentary rock, are not significant
9 aquifers (Kunkel, 1962; Bloyd, 1967; Carlson et. al., 1988; Leighton et.al., 2003, Phillips, Carlson et.
10 al., 2003). “Significant” is used here to generally refer to the possibility of developing the
11 groundwater in quantities such that it would likely be of potential interest to large water users such as
12 agriculture, industry or municipalities. Groundwater resources of bedrock areas comprising
13 numerous un-named outcrops within the watershed, are not known to be significant groundwater
14 resources.

15 6. Given that the consolidated rock lacks the hydraulic characteristics which allow
16 significant water development, it would be difficult to impact the consolidated rock aquifer through
17 development and pumping such that there would be measurable or manageable effects on the
18 available water in the unconsolidated aquifer deposits that form the main drainage basin and the
19 principal aquifer system. Therefore, with respect to the function of the consolidated rocks in the
20 groundwater basin, including the North Muroc sub-basin, the consolidated rocks constitute a
21 hydrologic boundary condition to the principal water bearing materials within the Antelope Valley
22 watershed which are unconsolidated alluvial and lakebed sediments (L.C. Dutcher, G.F. Worts, 1963;
23 Bloyd, 1967; Kunkel, 1962).

24 **Specific Discussion of Boundary in Vicinity of the North Muroc Sub-basin**

25 7. Given the role of consolidated bedrock vs. unconsolidated sediments in the North
26 Muroc sub-basin, the extent of the adjudication boundary in this area should reflect the extent of the
27 unconsolidated deposits plus known subsurface boundary conditions imposed by bedrock elevational
28 highs that preclude groundwater movement. The DWR Bulletin 118 (2003) map shows the extent of

1 the surficial contact of unconsolidated deposits with bedrock. In general this map approximates the
2 extent of the unconsolidated deposits, but does not take into account areas where the subsurface
3 structure (elevation) of bedrock precludes groundwater movement between alluviated areas. For the
4 North Muroc sub-basin, U.S. Borax's proposed boundary takes into account both the surface
5 expression of bedrock and the subsurface bedrock structure and occurrence of developable quantities
6 of water. This boundary is partially based upon drilling conducted in the vicinity of the mine and
7 processing plant area of U.S. Borax's operations.

8 8. Referring to Exhibit A, U.S. Borax has conducted drilling in the area of T11N, R8W,
9 Sections 9, 16, and 17. This area has been indicated on some area mapping as part of the AVGB and
10 an apparent pathway for water movement from the area labeled on Exhibit A as "North Basin," into
11 the North Muroc Basin. Wells GWM-77, GWM-78, GWM-82, and GWM-81 in this area show the
12 unconsolidated materials to be dry (these well logs have been filed with Kern County and the DWR).
13 In addition, the bedrock in this area is 85 feet below land surface at elevation 2342 feet above mean
14 sea level, whereas the water level in the North Basin, as depicted by the potentiometric isopleths, is
15 approximately 100 feet lower. The potentiometric isopleths in the North Muroc are approximately
16 167 feet lower than the bedrock elevation. Exhibit A also shows that this area is bounded on both
17 sides by consolidated rocks outcropping at land surface at multiple locations, which is additional
18 indication of shallow bedrock. For these reasons, the bedrock in this area whether exposed at the
19 surface or buried at relatively shallow depth form a hydrologic boundary for the unconsolidated
20 materials aquifer.

21 9. In addition to the bedrock elevation and the difference in water elevation between the
22 North Basin and the North Muroc Basin, the water quality is diagnostically different. Water quality
23 data for 2004 available through the U.S. Geological Survey was examined for the North Muroc Basin
24 and the North Basin, supplemented by sampling and analysis conducted by U.S. Borax. This data
25 shows the total dissolved solids concentrations in the North Muroc basin average 542.5 mg/l, whereas
26 the North Basin water averages 720 mg/l—a difference of 177.5 mg/l or about 32.7%. This
27 difference suggests that these waters are chemically independent.
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