Michael R. Valentine, General Counsel
Harllee Branch, Staff Counsel
California Department of Fish and Game
Office of the General Counsel
1416 9th Street, 12th Floor
Sacramento, CA 95814
Telephone: (916) 657-4091
Fax: (916) 354-3805

STATE OF CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

In the Matter of: HEARING REGARDING THE LEGAL CLASSIFICATION OF GROUNDWATER EXTRACTED FROM THE NORTH GUALALA WATER COMPANY'S WELLS 4 AND 5 UNDER PERMIT 14853	**CLOSING STATEMENT OF CALIFORNIA DEPARTMENT OF FISH AND GAME**

I.

INTRODUCTION

Substantial evidence demonstrates that a subterranean stream flowing through a known and definite channel exists beneath Elk Prairie and likely exists through the stretch of the North Fork Gualala River canyon from Robinson Creek downstream to at least the confluence with the Little North Fork Gualala River. All four elements of the current legal test that the State Water Resources Control Board (SWRCB) currently employs to determine groundwater jurisdiction have been conclusively established. Specifically, a subsurface channel is present; the bed and banks of the subsurface channel are relatively impermeable; the course of the subsurface channel may be determined by reasonable inference; and groundwater is flowing in the channel. North Gualala Water Company's (NGWC) Wells 4 and 5 extract water from this subterranean stream and are thus subject to the permitting jurisdiction of the SWRCB. Furthermore, NGWC's proposed Wells 6 and 7 will likewise be subject to SWRCB jurisdiction since they are located in the same immediate vicinity as the currently-operating production wells,[1] and therefore are surrounded by virtually the same geophysical characteristics. The alleged flow of water through the northern bedrock bank into the Elk Prairie alluvium is irrelevant because it has no bearing on whether the outward migration of groundwater from the subsurface channel is prevented. Even if it was relevant, NGWC has failed to conclusively demonstrate that such discharge actually occurs. Although the flow direction of the groundwater at Elk Prairie is not flowing parallel to the surface stream, flow direction in relation to a particular point in a surface stream is irrelevant because it has no bearing on the subsurface hydrogeology that governs the functioning of a subterranean stream.

If Permit 14853 does not remain in effect, NGWC would be free to significantly expand the volume of its well diversions without resource-protective conditions. There is a substantial likelihood of impacts to surface flows, owing to the close proximity of NGWC's wells to the hydraulically-connected North Fork Gualala River. Although limited data currently exist as to stream impacts from groundwater extraction,[2] elevated pumping rates would foreseeably expand cones of depression through the highly permeable alluvial material at Elk Prairie into contact with the river. Adequate fishery flows may therefore be put in jeopardy.

Based on both law and significant resource concerns, DFG respectfully requests a finding by the SWRCB that NGWC's operations should remain subject to the conditions of Permit

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[1] *See* NGWC Exhibit 8, Figure 6-1.

[2] On at least one occasion, the pumping of NGWC's production wells resulted in a hydraulic response in the river. DFG Exhibit 14, Figures 4-7, 4-8, and Table 4-3.

14853. A petition to add points of diversion to Permit 14853 would be necessary if proposed Wells 6 and 7 go into operation.

II.

SUBSTANTIAL EVIDENCE DEMONSTRATES THAT GROUNDWATER IS FLOWING BENEATH ELK PRAIRIE IN A SUBTERRANEAN STREAM THROUGH A KNOWN AND DEFINITE CHANNEL

All four elements of the current legal test for SWRCB jurisdiction over groundwater extraction have been established by substantial evidence submitted in this proceeding. Therefore, Permit 14853 must remain in effect for NGWC's groundwater extraction operations.

The SWRCB's permitting jurisdiction over groundwater extends to the water of subterranean streams flowing through known and definite channels. (California Water Code, §§ 1200, 1201, 1202, 1253.) Although the Water Code itself does not provide a conclusive definition of what constitutes a "subterranean stream," the California Supreme Court case of City of Los Angeles v. Pomeroy, 124 Cal. 597, 57 P. 585 (1899), has historically guided the interpretation of this term. Much of Pomeroy is dedicated to defining the difference between percolating groundwater and subterranean streams. The Court found that a dividing line between the two may be established by determining whether or not the flow of groundwater possesses the general characteristics of a surface stream.[3] In essence, groundwater must *act* like a surface stream in order to be subject to the *law* of surface streams.

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[3] "To maintain the right to a water course or brook, it must be made to appear that the water usually flows in a certain direction and in a regular channel, with banks or sides, though it need not be in a straight line. Waters, whether under or above ground, having no certain general course or definite limits, such as those merely percolating through the strata of the earth and those diffused over its surface, are not water courses, and are not subject to the rules of law applicable to water courses. *To entitle an underground stream to the consideration of the law, it is necessary that it be a water course, in the proper sense of the term.* Percolations which spread themselves in every direction through the earth do not constitute water courses." (Pomeroy, 124 Cal., at 626.Emphasis added.)

Pomeroy established certain key physical characteristics that must be present to demonstrate that groundwater is functioning like a surface watercourse. First, a "defined" underground stream must exist. (124 Cal., at 634.) According to the Court, this means that groundwater must be in a "contracted and bounded channel, though the course of the stream may be undefined by human knowledge." (Id.) Second, the course of the underground stream must be "known," meaning that "knowledge of the course of the stream" may be had by "reasonable inference." (Id.) Third, the underground stream must have a bed and banks. (Id., at 626.) The bed and banks may consist of any material that confines the water within circumscribed limits. (Id., at 623.) In Pomeroy, the bed and banks were "rocky and comparatively impervious mountain sides on either hand" of the channel. (Id.)

In Section 3.1 of the SWRCB's decision in Garrapata, D-1639 (1999), the SWRCB distilled the Pomeroy elements into the following four prerequisite physical conditions to a finding of jurisdiction over groundwater extraction:

1. A subsurface channel must be present;
2. The channel must have relatively impermeable bed and banks;
3. The course of the channel must be known or capable of being known by reasonable inference;
4. Groundwater must be flowing in the channel.

The SWRCB and legal commentators currently accept the "Garrapata test" as the applicable legal analysis to determine groundwater jurisdiction.[4] Substantial evidence presented in this hearing demonstrates that the geophysical characteristics surrounding Elk Prairie satisfy this test.

[4] *See* Scott S. Slater, California Water Law and Policy § 11.03; also Joseph L. Sax, Review of the Laws Establishing the SWRCB's Permitting Authority Over Appropriations of Groundwater Classified As Subterranean Streams and The SWRCB's Implementation of Those Laws, p. 5 (2002).

A. A Subsurface Channel Is Present Beneath Elk Prairie Because The Sides Of The North Fork Gualala River Canyon Intersect Below The Surface, Bounding An Alluvial Channel

Substantial evidence demonstrates that a subsurface channel exists at Elk Prairie. In Garrapata, the SWRCB found that a subsurface channel was formed by the intersection of the sides of the Garrapata Creek canyon below the alluvium. (D-1639, Section 3.3.2.) The canyon walls formed the banks and the intersection formed the bed of a channel. (Id.)

The geology of the North Fork Gualala River canyon is remarkably similar. The river flows through an incised bedrock canyon, as demonstrated by the highlighted yellow portion of DFG Exhibit 9. The bedrock confines of this canyon bound an alluvial channel, filled with fine-grain soils, sandy silt, silty clay, sands and gravels, and other fine-grained material. (DFG Exhibit 14, page 7; Figures 2-2, 2-3 and 2-4.) The projected contours of the slopes of this bedrock canyon intersect below the alluvium. (DFG Exhibit 14, Geologic Cross Sections A-A', B-B', and C-C'.) Thus, as in Garrapata, the walls of the canyon form the banks and the intersection forms the bed of a channel. There is little dispute in the record that a subsurface channel is present at Elk Prairie.[5]

B. The Bed And Banks Of The Subsurface Channel Are Relatively Impermeable Because The Specific Capacity And Hydraulic Conductivity Of The Alluvium Are Several Orders Of Magnitude Greater Than The Surrounding Bedrock

Figures for specific capacity and hydraulic conductivity indicate that the bed and banks of the subsurface channel are relatively impermeable. In Garrapata, the SWRCB found that the bedrock surrounding a subsurface channel must be sufficiently impermeable to bound the flow of

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[5] See NGWC testimony of Joseph Scalmanini, "And in looking at the four characteristics or tests…Is there a channel present? Probably so." (Recorder's Transcript, p. 51: 7-9.)

groundwater and prevent the transmission of all but minor quantities of water through the channel boundary. (D-1639, Section 3.3.2.) Essentially, there must be a sufficient difference in permeability between the alluvium and bedrock. The bedrock need not be absolutely impermeable. (Id.) Although neither the courts nor the SWRCB have quantified a specific permeability contrast, it was sufficient in Garrapata that the specific capacity of the alluvium was "several orders of magnitude" greater than the specific capacity of the bedrock bed and banks. (Id.) The same permeability contrast exists at Elk Prairie.

According to DFG's expert witness, Kit Custis, the permeability of the alluvium at Elk Prairie is two-and-a-half to three orders of magnitude greater than the surrounding bedrock. The specific capacity of NGWC's pumping wells in the alluvial aquifer range from 90 gpm/ft for production well PW-5 to 130 gpm/ft for production well PW-4. (NGWC Exhibit 8, pp. 11-12.) Respective well drawdowns are 7.4 and 9 feet. (Id.) In contrast, the average specific capacity of Coastal Belt Franciscan greywacke bedrock, which forms the bed and banks of the Elk Prairie subsurface channel, is only 0.265 gpm/ft. (DFG Exhibit 6, Table 6; DFG Exhibit 16.) Well drawdown averages approximately 68 feet. (Id.) Based on these figures, Mr. Custis calculated that the specific capacity of the alluvium is 2.66 orders of magnitude greater than the bedrock. (Recorder's Transcript, hereinafter "RT," p. 95: lines 1-3.) Figures for both transmissivity and hydraulic conductivity are similar -- ranging from 2.87 to 3 orders of magnitude. (RT, p. 95, line 3 – p. 96, line 16.) This permeability contrast does not appear to be in dispute.[6]

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[6] See NGWC testimony of Joseph Scalmanini, "Is there a relative impermeability? Well, in terms of pure numbers, the formation to the north, the Franciscan formation, is relatively or comparatively lower in hydraulic conductivity or permeability than the alluvial materials." (RT, p. 51: 10-14.)

In Garrapata, the SWRCB stated that the condition of relatively impermeable bed and banks "must be shown to exist only in a reach that includes the point of diversion, *not necessarily throughout the entire length of the alluvial aquifer*." (D-1639, Section 3.3.2. Emphasis added.) The bed and banks of the subterranean channel at Elk Prairie have been demonstrated to be relatively impermeable. However, for reference, roughly the same permeability contrast most likely exists throughout the course of the subsurface channel in the North Fork Gualala River canyon between Robinson Creek and the confluence with the Little North Fork Gualala. The entire subsurface channel in this reach is surrounded by the same Coastal Belt Franciscan bedrock and filled with virtually the same alluvial materials that are found at Elk Prairie. (DFG Exhibit 9.) It is entirely reasonable to infer that because substantially the same materials at Elk Prairie are found throughout the North Fork Gualala River canyon, the same permeability contrast likely exists as well. Although there are no specific data for the specific capacity of the alluvial material outside of the immediate point of diversion, it is not likely to differ dramatically from the specific capacity at Elk Prairie.

C. The Course Of The Subsurface Channel May Be Inferred By Projecting The Slope Of The Walls Of The North Fork Gualala River Canyon To Their Intersection Beneath The Alluvium

In Garrapata, the course of the subsurface channel in the Garrapata Creek canyon was established by reasonable inference by projecting the slope of the canyon sides at any particular point to their intersection beneath the alluvium. (D-1639 at Section 3.3.2.) It was only necessary that the subsurface channel was *capable* of being determined in this manner – a complete underground mapping of the channel was not required. (Id. at Sections 3.1 and 3.3.2.)

The same technique used in Garrapata is capable of establishing the course of the channel in and around Elk Prairie. A bedrock canyon incised into the Coastal Belt Franciscan Formation by the North Fork Gualala River bounds alluvial materials both in the Elk Prairie area and through the general course of the river. (DFG Exhibits 9 and 10.) The course of the channel can be inferred simply by projecting the sides of this canyon at any particular point to their intersection beneath the alluvium.

Topographic and geological maps of the North Fork Gualala River area support a reasonable inference that the subsurface channel runs in a generally southwesterly course from Robinson Creek, bends to the west at Elk Prairie, and then diverts south near the Little North Fork where the San Andreas Fault cuts a linear, southeast-trending valley. (DFG Exhibit 9; NGWC Exhibit 5; DFG Exhibit 1, p. 5.) NGWC does not seem to dispute this element of the Garrapata test.[7]

D. Elevation Gradients Demonstrate That Groundwater Is Flowing In The Subsurface Channel Within The North Fork Gualala River Canyon Under The Influence Of Gravity

Elevation data for surface, bedrock, and groundwater demonstrate that gravity draws flow in a unified, generally southwesterly direction in the entire stretch of the subsurface channel from Robinson Creek to the Little North Fork Gualala River. In Garrapata, the SWRCB determined that groundwater was flowing in a subsurface channel based upon the following findings:

> "Groundwater within the alluvium flows under the force of gravity, within the channel formed by the sloping walls of the canyon, toward the ocean, in the same fashion as the surface flow in Garrapata Creek, though moving with much less velocity than the surface stream." (D-1639, Section 3.3.2.)

Again, similarities can be drawn between Garrapata and this case. Data taken at Elk Prairie demonstrate that groundwater flows in a generally southwesterly direction. (NGWC Exhibit 7,

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[7] *See* NGWC testimony of Joseph Scalmanini, "Is there a course of channel that could be defined? Probably so. We can map it reasonably so with the work that's been done to date." (RT, p. 51: 14-16.)

Figures 10, 11, 15.) This flow direction results from the basic hydrological rule that groundwater flows under the influence of gravity from areas of high potential to areas of low potential. In other words, groundwater will flow from higher elevation to lower elevation. Groundwater elevation contours at Elk Prairie are generally higher to the northeast and lower towards the southwest. (Id.) A cursory review of this evidence demonstrates that unlike percolating groundwater, which generally disperses in all directions,[8] the flow direction of the groundwater at Elk Prairie is *unified*. Thus, it is clear that groundwater is flowing in the subsurface channel at Elk Prairie.

Taking into account elevation differences, the permeability contrast, and basic concepts of hydrology, it is highly probable that groundwater flows in a generally southwesterly direction in the entire subsurface channel between Robinson Creek and the Little North Fork Gualala River. The elevation of the surface of the ground at Robinson Creek is somewhere between 80 and 120 feet above sea level. (NGWC Exhibit 10.) The bedrock bed elevation near Robinson Creek has been estimated to be about 0 feet mean sea level. (DFG Exhibit 24.) The elevations at the downstream reaches of the channel are lower. The elevation of the surface of the ground at the Little North Fork Gualala is less than 40 feet above sea level. (NGWC Exhibit 11.) The bedrock bed elevation at Elk Prairie is approximately 130 feet below sea level. (DFG Exhibit 24.) Thus, a surface elevation difference of at least 40 feet exists between Robinson Creek and the Little North Fork. A bedrock bed elevation difference of around 130 feet exists between Robinson Creek and Elk Prairie. It is undisputed in the record that groundwater is very likely flowing throughout the length of the subsurface channel in this stretch. NGWC impliedly accepts

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[8] Wells A. Hutchins, California Law of Water Rights (1956) at 426; City of Los Angeles v. Pomeroy, 124 Cal. 597, 626 (1899).

this phenomenon.[9] The alluvium in this stretch of subsurface channel is likely several orders of magnitude more permeable than the surrounding bedrock bed and banks (see discussion above at pages 6-7), thus preventing groundwater from flowing out of the channel again. Some of the groundwater that enters the channel may discharge to the North Fork Gualala, although has not been conclusively established. (RT, p. 80: 5-7.) Any groundwater that does not enter the surface stream has no other direction to move but with the force of gravity and the course of the bed and banks. Consequently, it is likely that groundwater is flowing throughout the length of this portion of the subsurface channel in an overall southwesterly direction. Indeed, NGWC concedes that upstream of Elk Prairie, groundwater is likely flowing in the same direction as the North Fork Gualala River.[10]

III.

THE DISCHARGE OF WATER FROM BEDROCK INTO ALLUVIUM IS IRRELEVANT BECAUSE IT HAS NO BEARING ON THE CONFINEMENT OF THE OUTWARD MIGRATION OF GROUNDWATER FROM THE SUBSURFACE CHANNEL

If water discharges from the bedrock banks into the alluvium of a subsurface channel, it most certainly contributes tributary flow. It cannot, however, negate the existence of that subterranean stream if the outward migration of groundwater from the channel is prevented. NGWC alleges that water flows across the bedrock banks into the subsurface alluvium at Elk Prairie and thus claims that water is not confined within the channel. This conclusion is erroneous because it is directly conflicts with the second element of the Garrapata test (i.e.

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[9] *See* generally cross-examination of NGWC witnesses by SWRCB hearing team, RT pp. 80-81. Joseph Scalmanini states that, "...[T]his is, I'll call it, a perennial stream, there is a component of groundwater that discharges to the stream throughout the watershed."

[10] *See* NGWC testimony of Joseph Scalmanini, "And then there is probably some flow in the alluvium associated with the streambed to the east that is in the same direction…common sense on how groundwater flows and discharges to a gaining reach of stream would suggest that is the case." (RT, p. 81: 1-7.)

"relatively impermeable bed and banks") which is meant to conclusively decide whether groundwater is confined to a subsurface channel. NGWC concedes that there is a sufficient permeability contrast at Elk Prairie. It attempts to overcome this obstacle by improperly re-characterizing the fourth element of the test as a second opportunity to address groundwater confinement.

The issue of confinement is conclusively disposed of by the "relatively impermeable bed and banks" element of the Garrapata test, which originates from language in Pomeroy. As the Court indicated in that case, a key characteristic of a subterranean stream is that water in the subsurface channel *stays* in the channel:

> "While a water course must have a bed and banks or sides…such bed may consist of any material which keeps the waters from penetrating below a certain depth, and such banks or sides may consist of any material which has the effect of confining the waters *within* circumscribed limits." (124 Cal., at 623. Emphasis added.)

Legal commentators support the idea that the bed and banks must prevent the movement of groundwater ***out of the channel*** in order for a subterranean stream to exist.[11] In Pomeroy, the "comparatively impervious mountain sides on either hand" of the channel were an adequate barrier to the outward migration of water. (124 Cal., at 632.) The "comparatively impervious" language from Pomeroy was restated by the SWRCB in Garrapata as "relatively impermeable." Thus, when the "relatively impermeable" element is approached, it is meant to determine whether material exists that confines the flow *within* the channel – not whether water is kept *out* of the channel.

It is virtually undisputed in this proceeding that the bed and banks of the subterranean channel are relatively impermeable in comparison to the alluvium. Thus, the confinement issue is

[11] *See* Scott S. Slater, California Water Law and Policy § 11.01, "To constitute subsurface flow, however, there must be lateral limits to the *outward migration* of the ground water." (emphasis added)

conclusively established. Even NGWC concedes that groundwater elevation data and other exhibits submitted in this proceeding do not demonstrate any movement of groundwater out of the subsurface channel:

> "Mr. Branch: This groundwater flow…is not demonstrated on this exhibit [NGWC Exhibit 7, Figure 10] as flowing back into the bedrock, is it?
> Mr. Scalmanini: No…
> Mr. Branch: I have the same questions for Figure 11 [NGWC Exhibit 7]. Do these groundwater flow charts demonstrate any flow back into the bedrock?
> Mr. Scalmanini: No…
> Mr. Branch: Finally Figure 14, these arrows you demonstrate as flow coming out of the bedrock, correct?
> Mr. Scalmanini: That's correct.
> Mr. Branch: There is no flow going back into the bedrock?
> Mr. Scalmanini: That is correct." (RT, p. 256, line 5 – p. 257, line 3.)

Thus, confinement is conclusively established not only by the permeability contrast, but by the testimony of NGWC's primary witness as well. NGWC attempts to skirt this obstacle by characterizing the final element of the Garrapata test (i.e. "groundwater flowing in the channel") as a groundwater confinement determination.[12] It thus attempts to afford itself a second bite at the apple. However, it confuses and misinterprets the purpose of this element of the test.

By process of elimination, it becomes clear what the actual purpose of the "groundwater flowing in the channel" element is. It is not meant to determine whether a subsurface channel exists – this is established by the first element of the Garrapata test. It is not meant to determine whether groundwater is confined in the channel – confinement is instead established by a sufficient permeability contrast between the alluvium and the bedrock. It is not meant to determine the course of the subsurface channel – this is established in the third element of the test. Mindful that the ultimate determination of the Garrapata test is whether groundwater is

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[12] See NGWC testimony of Joseph Scalmanini, "But is the flow confined to that channel or is it flowing in that channel? And the answer is absolutely not. It is flowing across the channel and there is no confinement of flow as shown by the need for recharge to come across the boundary on the north side." (RT, p. 51: 17-21.)

acting like a surface stream,[13] it is logical that the "groundwater flowing in the channel" element must therefore establish any remaining stream-like characteristics that are not addressed by the other three elements of the test.

The most glaring physical characteristic that is missing from the first three elements of the Garrapata test is the presence of *water*. A second essential characteristic that is missing is the *flow of water*. Finally, acknowledging that all groundwater is flowing to some extent,[14] the final missing characteristic is *water flowing in a unified direction* with the banks of the channel. This final attribute is meant to ensure that the groundwater flow direction does not resemble the scattered, vagrant movement that would more accurately characterize a confined underground lake or unconfined percolating groundwater. In short, the purpose of the final element of the test, "groundwater flowing in the channel," is to answer the following three questions: 1) Is there water in the subsurface channel; 2) If so, is that water flowing; and 3) If water is flowing, is it flowing in a generally unified direction like a stream.

As to the subsurface channel at issue in this proceeding, substantial evidence answers all three of the above questions in the affirmative. First, it is undisputed that there is water in the subsurface channel. The fact that NGWC pumps water from its production wells in the channel alluvium disposes of this issue conclusively. Second, it is undisputed that the water in the subsurface channel is flowing. A cursory look at the groundwater elevation gradients at Elk Prairie demonstrates this. (NGWC Exhibit 7, Figures 10, 11, and 15.) Finally, it is undisputed

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[13] Wells A. Hutchins, California Law of Water Rights (1956) at 419; City of Los Angeles v. Pomeroy, 124 Cal., at 626 (1899).

[14] *See* NGWC rebuttal testimony of Joseph Scalmanini, "...[F]undamentally all groundwater is flowing." (RT, p. 230: 13); also Scott S. Slater, California Water Law and Policy § 11.01.

that the water in the subsurface channel at Elk Prairie is not flowing in scattered and vagrant directions. Instead, it is clearly illustrated as flowing in a unified, southwesterly direction. (Id.) Therefore, it is clear that groundwater is flowing in the subsurface channel at Elk Prairie according to the proper characterization of the final element of the Garrapata test.

Despite a sufficient permeability contrast, despite NGWC's concession that groundwater in the channel does not escape the banks, and despite admitting that once groundwater enters a subterranean channel it becomes a subterranean stream,[15] NGWC still somehow claims that groundwater is *not* confined in the channel. NGWC's position in the face of its own admissions to the contrary defies logic.

IV.

EVEN IF DISCHARGE OF WATER FROM BEDROCK INTO ALLUVIUM IS SOMEHOW RELEVANT, NGWC HAS NOT CONCLUSIVELY ESTABLISHED THAT SUCH DISCHARGE IS OCCURRING AT ELK PRAIRIE

NGWC claims that water is discharging from the bedrock into the alluvium at Elk Prairie based on the direction of groundwater flow. This does not negate the existence of a subterranean stream. However, even if such a discharge *was* relevant to a determination of SWRCB groundwater jurisdiction, NGWC has failed to conclusively establish that this phenomenon is actually occurring.

In its oral testimony, NGWC claims that water is flowing relatively perpendicular to the flow of the North Fork Gualala River at Elk Prairie and that this phenomenon must be due to water discharging from the bedrock on the north side of the subsurface channel. (RT, p. 47 line 14 – p. 48, line 21.) Credible evidence, however, suggests several alternate explanations for this

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[15] *See* NGWC rebuttal testimony of Joseph Scalmanini, "...[I]f water ultimately gets into a channel and is confined in that channel and satisfies all those tests, regardless of where it came from, then it would fit the definition of a subterranean stream channel." (RT, p. 229: 13-16.)

flow direction. First, it should be noted that NGWC is making somewhat of a leap of faith to suggest that groundwater is coming out of the bedrock at Elk Prairie, given it has presented absolutely no groundwater elevation data for the nearly 400 feet between the northernmost groundwater contour at MW-4 and the edge of the alluvium. In essence, NGWC presents no direct evidence as to what is *actually* happening at the contact between the bedrock and alluvium. Although it claims that seeps and springs have been observed discharging water from the bedrock, NGWC has not conclusively established that this occurs at the point of diversion.

Second, it appears that groundwater actually flows from east-to-west in the subsurface channel just upstream of Elk Prairie, encounters an impermeable clay cap bounding the alluvium from the top and sides at the point of diversion, and alters its flow direction within the confines of this cap toward the southwest. As discussed above, circumstantial evidence demonstrates that groundwater is flowing generally with the subsurface channel towards the southwest from Robinson Creek to Elk Prairie. The subsurface channel just upstream of the Elk Prairie area bends from southwest towards the west. It is logical to assume that groundwater would thus be flowing generally in an east to west direction at this point as well. Direct evidence seems to support this phenomenon.

DFG Exhibit 27, page 2187 is a profile of the North Fork Gualala River showing the surface water and streambed profile between points up and downstream of Elk Prairie. "Section 2" on this profile is located at the approximate location of the stream gauge SG-1.[16] The slope of the surface water upstream of this point is 0.32%. An increase in upstream surface water elevation of between 1.6 and 2.24 feet is established by projecting this slope to points 500 and

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[16] DFG Exhibit 27. "Section 2" is described on page 2185 as being adjacent to Well #4 (a.k.a. PW-4). On the map on page 2182, Section 2 is marked at a point on the North Fork Gualala directly south of PW-4. This is the approximate location of SG-1 (see NGWC Exhibit 8, Figure 4-1).

700 feet upstream of the location of stream gauge SG-3.[17] These upstream points are located in the center of the river almost directly east of MW-4 and MW-5, respectively. When these surface water elevations are added to the elevation figures for SG-3,[18] it reveals that the surface stream elevation upstream of Elk Prairie is virtually always higher than the groundwater elevation at the east end of Elk Prairie at monitoring wells MW-4 and MW-5.[19] Because the surface water elevation is higher than the groundwater elevation and because the stream and subsurface channel are hydraulically connected,[20] the flow direction must necessarily be from east to west between these points on the North Fork Gualala River and MW-4 and MW-5. Although NGWC claims that such a flow direction cannot be extrapolated from two data points, it ignores the fact that *four* points are actually used.

At Elk Prairie, a clay cap overlays the top of the subsurface channel. (NGWC Exhibit 8, Figures 2-2 and 2-3.) DFG's expert estimated that this clay cap is probably one or two orders of magnitude less permeable that the subsurface channel alluvium. (RT, p. 212: 19-24.) DFG Exhibit 25 illustrates elevation contours in red showing the depth at which contact between the clay cap and the course-grained subsurface channel occurs. These contours are superimposed on the groundwater contours from NGWC Exhibit 8, Figure 4-5 and are extrapolated from

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[17] This determination results from calculating "rise over run." In other words, going upstream 500 feet at a slope of .32 percent results in an increase of 1.6 feet; going upstream 700 feet at .32 percent slope results in an increase of 2.24 feet.

[18] *See* NGWC Exhibit 8, Table 4-2.

[19] For example, adding 2.24 feet to the elevation at SG-3 on 6/12/97 results in a surface water elevation of 34.12. The elevation directly east at MW-4 on that date was 33.51. Adding 1.6 feet to the elevation at SG-3 on this date results in an elevation of 33.48 feet. The elevation of MW-5 on that date was 32.05.

[20] *See* NGWC rebuttal testimony of Joseph Scalmanini, "...[T]here is connectivity between the stream and the aquifer system. There is no debate about that." (RT, p. 233: 12-13.)

information contained in numerous well logs for the diversion area.[21] The clay cap curves from shallow to deep as one crosses it from south to north. As the clay formation stretches downstream, the orientation of its shape bends to the southwest. Thinking three-dimensionally, this clay cap essentially resembles the top of a pipe. This "pipe" acts as a sort of conduit, funneling groundwater flowing from the east and redirecting its flow towards the southwest. This phenomenon is illustrated by the clay cap contours being virtually at a perpendicular angle to the groundwater contours. (DFG Exhibit 25.) In short, the groundwater flow direction does not illustrate flow from the bedrock. On the contrary, it simply illustrates the influence of a confining clay cap.

By pulling back focus from the diversion point to the area as a whole, it appears that the direction of flow at Elk Prairie also illustrates that groundwater is making a turn to the south to join the southeasterly trending canyon that takes the North Fork Gualala River towards its confluence with the South Fork. As illustrated on numerous exhibits, Elk Prairie is located immediately upstream from where the North Fork Gualala River canyon makes a sharp bend towards the south into a canyon formed by the San Andreas Fault. (NGWC Exhibit 8, Figure 4-1; NGWC Exhibit 11; DFG Exhibit 9; DFG Exhibit 1, p. 5.) This canyon is bound on the west by German Rancho Formation bedrock (DFG Exhibit 9) that is even less permeable that the Franciscan bedrock that bounds the channel at Elk Prairie.[22] The alluvium in the southerly channel is shown on DFG Exhibit 9 as being composed of essentially the same material as Elk Prairie. The surface water of the North Fork Gualala flows south through this channel towards

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[21] *See* Appendix B, NGWC Exhibit 8.

[22] *See* SWRCB Permitting Team Exhibit 10, Table 6. Mean specific capacity of German Rancho Formation bedrock is listed as .06 gpm/ft. In comparison, Coastal Belt Franciscan bedrock has a specific capacity of 0.265 gpm/ft.

the ocean, demonstrating that the northern reach of this canyon is higher in elevation than the southern reach. Thus, groundwater cannot flow to the west, due to the impermeable German Rancho bedrock on the western edge of the canyon. It cannot flow north since the elevation is higher and groundwater cannot flow uphill. Consequently, once groundwater in the subsurface channel gets to Elk Prairie, it has no other direction to go but south with the trend of the canyon.

V.

THE DIRECTION OF GROUNDWATER FLOW RELATIVE TO A PARTICULAR POINT IN A SURFACE STREAM IS IRRELEVANT BECAUSE IT HAS NO BEARING ON THE HYDROGEOLOGICAL CHARACTERISTICS OF THE SUBSURFACE CHANNEL

Although groundwater in the subsurface channel at Elk Prairie is not flowing in the exact same direction as the North Fork Gualala River, this phenomenon is irrelevant to the legal determination of the existence of a subterranean stream. The root of the SWRCB's jurisdiction over groundwater, Water Code § 1200, requires only that subterranean streams flow through known and definite channels. It makes absolutely no mention of a requirement that flow be in the same direction as a stream. Similarly, the <u>Garrapata</u> test only requires the existence of flow in the channel; it doesn't require that flow be in the same direction as a surface stream. According to the SWRCB, the only type of subsurface flow that needs to be in the same direction is the "underflow" of a surface stream. (D-1639 at Section 3.3.1.) Underflow, however, is ***<u>not</u>*** an essential element in finding the existence of a subterranean stream. (<u>Id</u>.) In fact, jurisdictional subterranean streams may occur entirely disconnected from a surface stream. (<u>Id</u>.) Thus, the subsurface channel may be analyzed in isolation by the hydrogeological characteristics that define it. In regards to flow direction, the only such characteristics that matter are the subsurface bed and banks and the influence of gravity. The action of the surface stream is irrelevant.

VI.

CONCLUSION

All four of the elements of the current legal test for SWRCB groundwater jurisdiction have been established by substantial evidence. These elements are largely undisputed by NGWC, which banks its case on the fact that water flows into the subsurface channel at Elk Prairie through the northern bedrock bank. However, this phenomenon does not negate the existence of a subterranean stream because it has no bearing on whether the outward migration of groundwater from the subsurface channel is prevented. Even if flow from the bedrock to the alluvium *were* somehow relevant, NGWC has failed to conclusively prove that this phenomenon actually occurs. In fact, credible evidence demonstrates that groundwater flows from the alluvium upstream from Elk Prairie and encounters a clay cap that diverts subsurface flow to the southwest. At that point it appears to join the course of the North Fork Gualala River canyon as it trends towards the south. Although the flow direction of the groundwater at Elk Prairie is not flowing parallel to the surface stream, previous SWRCB decisions as well as basic conceptual sense dictate that flow direction in relation to a surface stream is irrelevant because it has no bearing on the subsurface hydrogeology that governs the functioning of a subterranean stream.

Because substantial evidence demonstrates that groundwater is flowing in a subterranean stream through known and definite channels beneath Elk Prairie, the extraction of groundwater by NGWC from Wells 4 and 5 and proposed Wells 6 and 7 is subject to the permitting jurisdiction of the SWRCB. DFG respectfully asks that Permit 14853 remain in effect. If Wells 6 and 7 go into operation for domestic supply, NGWC should file a petition to add points of diversion to Permit 14853.

Dated: August 23, 2002

By: [signature]
Harllee Branch,
Staff Counsel