EXHIBIT G

July 16, 2002
Project No. 8029.000.0

Mr. Richard G. Zimmer Esq.
Clifford & Brown
1839 Commerce Center Drive
Bakersfield, CA 93301

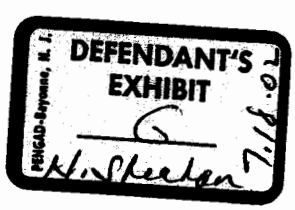
RE: Letter Report
Summary of Assessment of Phase 1 Issues,
Wm. Bolthouse Farms, Inc. v. City of Lancaster, et al.
RCSC Case No. RIV 344436
(Consolidated with Case Nos. 344668 & 353840)

Dear Mr. Zimmer:

In accordance with my confirmation of your oral authorization, dated March 9, 2002, you have engaged my services, and the services of Geomatrix Consultants, Inc., to consult and provide expert testimony concerning Phase 1 of the reference matter. As part of those services, you have asked me to address certain issues. This letter presents the results of my work regarding these Phase 1 issues.

SCOPE OF SERVICES

During our discussions, you asked me to review the geologic, hydrogeologic, and other physical conditions in the Antelope Valley and vicinity, and to consider various aspects of Phase 1 of the reference matter including the document entitled *Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-*



Water Basin, (hereinafter, **"L&S Technical Memorandum"**),[1] the three-volume transcript of deposition of Mr. Joseph C. Scalmanini taken in this matter (hereinafter, **"Scalmanini Transcript"**),[2] and the document entitled *Status Conference Report of Plaintiff Diamond Farming Company* (hereinafter, **"Phase 1 Stipulation"**).[3] To address the Phase 1 issues, I have identified five specific Tasks, which are listed below.

Task No. 1. Review and critique the L&S Technical Memorandum.

Task No. 2. Review the Phase 1 Stipulation to develop an understanding of the requirements for Phase 1 that are stated therein.

Task No. 3. Select scientifically-based and other appropriate methods for defining the boundary of an area that would meet the requirements of the Phase 1 Stipulation.

Task No. 4. Determine whether the boundaries shown on Plate No. 1 of the L&S Technical Memorandum define an area that meets the requirements of the Phase 1 Stipulation.

Task No. 5. Define the boundary of an area that meets the requirements of the Phase 1 Stipulation using the methods selected as part of Task No. 3.

INFORMATION REVIEWED AND RELIED UPON

In addressing these five Tasks, I have reviewed a number of technical reports, deposition transcripts, and other documents. The documents I have reviewed for the purposes of addressing these Tasks are listed in Exhibit "A" to this letter. I have also made personal inspections of the Antelope Valley, and the surrounding areas in Los Angeles, Kern, and

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[1] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January.

[2] Scalmanini, J.C., 2002b, Deposition of Joseph C. Scalmanini, P.E., Compressed Transcript, Diamond Farming vs. City of Lancaster, (Volume I, March 11, 2002, Volume II, June 10, 2002, and Volume III, June 24, 2002).

[3] Superior Court of California, County of Riverside, 2002, *Diamond Farming Company v. City of Lancaster, et al. and Wm. Bolthouse Farms, Inc. v. City of Lancaster, et al.*, Case NO. RIC 344436 (Consolidated w/ Case Nos. 344668 & 353840), Status Conference Report of Plaintiff Diamond Farming Company, May 3.

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San Bernardino Counties, California, and have observed the general physiographic, geologic, and hydrogeologic characteristics of those areas. The documents that I have relied upon are shown in footnotes to this Letter Report. I have also relied upon my professional experience in reviewing the technical and other information and in making my assessments of the five Tasks.

DISCUSSION

The following paragraphs present a discussion of each of the five Tasks described above, which summarizes the bases for my opinions. My professional opinions are presented at the end of this Letter Report.

1. Review and Critique of the L&S Technical Memorandum and the Scalmanini Transcript.

The L&S Technical Memorandum is not signed, and there is no indication in the document as to the author or authors of the document. During his deposition, Mr. Joseph C. Scalmanini indicated that he was the principal author, although certain sections were prepared by others at his firm.[4] The document does not state professional opinions, per se; however, during his deposition, Mr. Scalmanini indicated that some of the information presented in the document represented his opinions.[5]

The scope or purpose of the L&S Technical Memorandum is not stated in the document. During his deposition, Mr. Scalmanini stated that he had not seen the Phase 1 Stipulation. Therefore it can be reasonably assumed that it was not a purpose of the L&S Technical Memorandum to define an area intended to meet the requirements of the Phase 1 Stipulation.[6] In general, it appears that the purpose of the document was to present

[4] Scalmanini, J.C., 2002b, Deposition of Joseph C. Scalmanini, P.E., Compressed Transcript, Diamond Farming vs. City of Lancaster, (Volume I, March 11, 2002, Volume II, June 10, 2002, and Volume III, June 24, 2002).
[5] *Ibid.*
[6] *Ibid.*

information concerning "ground-water basin boundaries" in the Antelope Valley vicinity based solely upon the work by others. In discussing groundwater basin boundaries, however, the L&S Technical Memorandum notes, that in practice the term *groundwater basin* is loosely defined.[7] It must be concluded, therefore, the boundaries of groundwater basins must also be loosely defined.

During his deposition, Mr. Scalmanini indicated that neither he nor anyone else under his direction has performed any independent investigation concerning the matters discussed in the document.[8] The L&S Technical Memorandum does not define the study area that was considered in preparing the document. Notably, the document does not include any discussion of the Fremont Valley, the area adjacent and to the north of the Antelope Valley; neither does it discuss to any significant extent the Mojave Basin Area located east of the Antelope Valley. Without a definition of the purpose of the document or the study area to be considered in the document, it is difficult to characterize the importance of the L&S Technical Memorandum in connection with Phase 1 of this matter.

Concerning the subject of groundwater basin boundaries, the L&S Technical Memorandum summarizes the work of other authors (Bloyd, 1967; Durbin, 1978; and Carlson, et al., 1998) and presents a map as Plate 1 to the L&S Technical Memorandum that purports to be the "overall Antelope Valley Ground-Water Basin and its eight subbasins."[9] Plate 1 shows lines representing two groundwater basin boundaries, one by Bloyd (Bloyd, 1967) and one by Carlson and others (Carlson and others, 1998). Also shown on Plate 1 are groundwater subbasin boundaries (Bloyd, 1967, and Carlson and

[7] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January, p. 1.
[8] Scalmanini, J.C., 2002b, Deposition of Joseph C. Scalmanini, P.E., Compressed Transcript, Diamond Farming vs. City of Lancaster, (Volume I, March 11, 2002, Volume II, June 10, 2002, and Volume III, June 24, 2002).

others, 1998), and geologic faults in the Antelope Valley (no references given). Although not shown in the Legend, Plate 1 also shows two other lines in the southeastern corner of the map, one referred to as "Antelope Valley Ground-Water Basin Boundary Carlson and Phillips, 1998" , and the other designated "Antelope Valley and Mojave River Drainage Basin Boundary," with no reference to the sources. This portion of the area enscribed by the groundwater basin lines lies east of the western line of San Bernardino County. Comparison of the lines shown on Plate 1 with the actual line shown by Carlson and Phillips[10] shows that Plate 1 does not accurately depict the line referred to as "Antelope Valley Ground-Water Basin Boundary Carlson and Phillips, 1998."

Plate 1 incorrectly shows the postulated location of the San Andreas Fault Zone to be the same line as the southern segment of the line depicted as the Bloyd, 1967 basin boundary. The location of this fault zone as actually depicted by Bloyd and others, however, is considerably south of the location shown on Plate 1,[11,12,13] and follows the center of the general alignment of the Leona Valley, south of the Antelope Valley.

Although Plate 1 purports to depict the "overall Antelope Valley Ground-Water Basin and its eight subbasins,"[14] the L&S Technical Memorandum does not indicate which of the four separate basin boundary lines or line segments depicted on Plate 1 are intended to define the groundwater basin. In some areas, such as the northeast portion of the

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[9] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January, p. 8.
[10] Carlson, C.S., Phillips, S.P., 1998, Water Level Changes (1975-98) in the Antelope Valley, California: U.S. Geological Survey Open-File Report 98-561, Figure 1.
[11] Bloyd, R.M., 1967, Water resources of the Antelope Valley – East Kern Water Agency Area, California, U.S. Geological Survey Open-File Report , August 28.
[12] Carlson, C.S., Phillips, S.P., 1998, Water Level Changes (1975-98) in the Antelope Valley, California: U.S. Geological Survey Open-File Report 98-561.
[13] Dibblee, T.W., 1967, Areal geology of the western Mojave Desert, California: U.S. Geological Survey Professional Paper 552.
[14] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January, p. 8.

Antelope Valley, there are considerable differences in the locations of the two lines (one by Bloyd, 1967, and one by Carlson and others, 1998). The difference in areas encompassed by these two lines is in excess of 50 square miles. There is nothing in the document that would allow a reader to determine which of these lines, if any, should be used as the groundwater basin boundary for the Antelope Valley, or for what purpose such a boundary should be selected.

In describing segments of the lines shown on Plate 1 during his deposition, Mr. Scalmanini indicated that there was groundwater flow across several of the segments.[15] In particular, he noted that he understood that groundwater was flowing or could flow across the north boundary lines, the south boundary lines, and the southeast boundary lines. In the document, however, it is noted that boundaries that do not impede or obstruct the movement of groundwater across the boundaries are inappropriate selections for basin boundaries. There is no justification given in the document as to why these groundwater flow boundaries have been included on Plate 1 as groundwater basin boundaries. Concerning basin boundaries with no appreciable underflow, the L&S Technical Memorandum states that boundaries such as zones of low permeability and faults that form impermeable barriers do not affect the movement of groundwater.[16] I disagree with this statement. By definition, groundwater cannot flow across an impermeable barrier, and thus the groundwater is forced by the barrier to flow in another direction. Thus, these types of barriers significantly affect the movement of groundwater.

[15] Scalmanini, J.C., 2002b, Deposition of Joseph C. Scalmanini, P.E., Compressed Transcript, Diamond Farming vs. City of Lancaster, (Volume I, March 11, 2002, Volume II, June 10, 2002, and Volume III, June 24, 2002).
[16] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January, p. 4.

2. REVIEW OF THE PHASE 1 STIPULATION.

To properly focus on the limited issues associated with Phase 1, it is important to understand both the requirements of Phase 1 from a scientific perspective and the determinations and decisions that are intended to be addressed during Phase 2 of this matter. In this regard, the Phase 1 Stipulation states, in part:

> "Phase 1 will determine the area within which claims of groundwater rights will be adjudicated in this lawsuit and will include or exclude overlying properties from the lawsuit. "[17]

This portion of the Phase 1 Stipulation provides information concerning part of the requirements of the Phase 1 Stipulation in this matter. The issues in this matter relate to the water rights of property owners in the general vicinity of the Antelope Valley (hereinafter **"Phase 1 Area"**).[18] This current matter does not concern itself with properties that lie within areas wherein water rights have been previously adjudicated.[19] For example, the area immediately east of the Phase 1 Area, the Mojave Basin Area in San Bernardino County, has been previously adjudicated to determine water rights in that area.[20] Thus, Phase 1 does not concern properties located on lands within the Mojave Basin Area.

The Phase 1 Area, therefore, can be further defined as the area in the vicinity of the Antelope Valley, outside of any adjacent areas within which water rights have been previously adjudicated, and within which claims of water rights will be adjudicated in Phase 2. The boundary of the Phase 1 Area, (hereinafter **"Phase 1 Area Boundary"**) needs to be defined in Phase 1, and must be, at a minimum, the boundary of an area in the

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[17] Superior Court of California, County of Riverside, 2002, *Diamond Farming Company v. City of Lancaster, Palmdale and Wm. Bolthouse Farms, Inc. v. City of Lancaster, et al.*, Case NO. RIC 344436 (Consolidated W/ Case Nos. 344668 & 353840), Status Conference Report of Plaintiff Diamond Farming Company, May 3, p. 11.

[18] Personal communication with Richard G. Zimmer, Esq., Clifford & Brown.

[19] *Ibid.*

[20] Supreme Court of California, 2000, *City of Barstow et al. v. Mojave Water Agency et al.*, S071728, Ct. App. 4/2 E017881, E018923, Riverside County Super. Ct. No. 208568, Filed August 21.

vicinity of the Antelope Valley, outside of any adjacent areas within which water rights have been previously adjudicated, and within which claims of water rights will be adjudicated in Phase 2, such that the boundary will appropriately include or exclude overlying properties from the lawsuit.

The delineation of the Phase 1 Area Boundary is important to this matter for the additional reason that it will include or exclude overlying properties from the Phase 1 Area based on the potential for groundwater production effects.[21] In this regard, the Phase 1 Stipulation further states:

> "'The parties agree, and based on such agreement the court finds, that groundwater production from outside this area does not have, and has not had, any legally adverse effect on groundwater production inside the area, and vice versa. However, this determination will have no effect on the determination of whether production inside the area is legally adverse to other parcels and pumping inside the area. The hydrogeology of the area, the scientific [and] legal significance of these issues, and all other issues, will be decided in Phase 2."[22]

This portion of the Phase 1 Stipulation provides additional information concerning the requirements of the Phase 1 Stipulation for determining the Phase 1 Area Boundary. The Phase 1 Stipulation refers to both physical, or scientific, characteristics ("groundwater production") and legal characteristics ("legally adverse effect"). Thus, the Phase 1 Stipulation intends to address both of these aspects, as appropriate, in selecting the Phase 1 Area Boundary.

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[21] Superior Court of California, County of Riverside, 2002, *Diamond Farming Company v. City of Lancaster, et al. and Wm. Bolthouse Farms, Inc. v. City of Lancaster et al.*, Case NO. RIC 344436 (Consolidated w/ Case Nos. 344668 & 353840); Status Conference Report of Plaintiff Diamond Farming Company, May 3, pp. 1.

[22] Superior Court of California, County of Riverside, 2002, *Diamond Farming Company v. City of Lancaster, et al. and Wm. Bolthouse Farms, Inc. v. City of Lancaster, et al.*, Case NO. RIC 344436 (Consolidated w/ Case Nos. 344668 & 353840); Status Conference Report of Plaintiff Diamond Farming Company, May 3, pp. 1 and 2.

From a scientific perspective, the requirements of the Phase 1 Stipulation are as follows:

> **Using scientifically-based and other appropriate methods, define the boundary of an area in the vicinity of the Antelope Valley, outside of any adjacent areas within which water rights have been previously adjudicated, and within which claims of water rights will be adjudicated in Phase 2, such that the boundary will appropriately include or exclude overlying properties from the lawsuit, based on the potential for groundwater production effects.**

To meet the requirements of the Phase 1 Stipulation, it is first necessary to identify and select scientifically-based and other appropriate methods for defining the Phase 1 Area Boundary. This issue is addressed in the following section of this Letter Report.

3. Selection of Scientifically-Based and Other Appropriate Methods for Defining the Boundary of an Area that Meets the Requirements of the Phase 1 Stipulation.

The term "legally adverse effect on groundwater production" in the Phase 1 Stipulation does not identify a specific scientifically-based method for use in this assessment. Certain elements of that term, however, suggest a means for establishing a scientifically-based method for use. The following paragraphs present a discussion of how this term provides assistance in selecting an appropriate scientifically-based method, which, when applied in this matter, allows determination of the boundary of an area that meets the requirements of the Phase 1 Stipulation.

Regarding Groundwater Production

From a scientific perspective, the term "groundwater production" used in connection with the Phase 1 Area means the pumping of groundwater from wells, and applies to wells located either inside the Phase 1 Area or outside of that area. Pumping of groundwater from wells can be affected by a variety of physical factors including:

- the depth to the groundwater level;
- the transmissivity and hydraulic conductivity of the aquifer;
- the nature and efficiency of the well;
- the size and capacity of the pump; and
- the time of operation of the system.

These physical factors can be considered effects of groundwater production, and each factor is discussed in more detail, below.

From a scientific perspective, the key word in the term "legally adverse effect" in the Phase 1 Stipulation is the noun "effect." The other two words, "adverse" and "legally," are adjectives that modify the word "effect." If it is not generally possible for groundwater production on one side of a boundary to cause any effect on the other side of the boundary, then there would be no "effect" to be characterized as "legally adverse," or otherwise, and consequently, there would be no "legally adverse effect" due to groundwater production. It is important, therefore, to consider what effects can be caused by groundwater production from one well on groundwater production from another well.

Groundwater production from one well can sometimes cause changes in the groundwater levels at the location of other wells. By changing the groundwater levels, groundwater production from one well can cause another well to have to extract water from either a greater depth or a shallower depth. Either of these changes would have an effect on groundwater production from the other well. Groundwater production from a well that has been caused to have a greater depth to groundwater level would, all else being equal, result in one or more of the following:

- reduced pumping rate,
- reduced discharge pressure,
- increased energy costs, and/or
- increased cost for equipment modifications.

Any or all of these effects might be considered "adverse" if the effects are determined to be significant. According to the Phase 1 Stipulation, however, the scientific and legal significance of these effects are to be determined in Phase 2, and are not of importance to the Phase 1 issues discussed herein.

Groundwater production from a well can cause changes in aquifer hydraulic conductivity and/or transmissivity by lowering of the groundwater level in the aquifer. Hydraulic conductivity, also sometimes referred to as permeability, is the quantity of groundwater, under field conditions, that will flow through a unit volume of saturated material in unit time, through a cross section of unit area measured at right angles to the direction of flow, under a unit hydraulic gradient.[23] Transmissivity is a measure of the amount of water that can be transmitted horizontally through a unit width of aquifer by the full saturated thickness of the aquifer under a hydraulic gradient of unity.[24]

By lowering of the groundwater levels, groundwater production can cause a change in the saturated thickness of an aquifer, which reduces, proportionately, the transmissivity of the aquifer. Also, by lowering the groundwater level, groundwater production can cause consolidation of the aquifer material, which can result in a reduction of the transmissivity, hydraulic conductivity, and porosity of the formation. In some instances, subsidence of the land surface can also occur. Land subsidence has occurred in the Antelope Valley in the past.[25] The subsidence, however, is caused by changes in groundwater levels, and thus is not a separate and distinct effect of groundwater production.

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[23] Todd, D.K., 1980, *Groundwater Hydrology*, Second Edition, John Wiley & Sons, Inc., New York, p. 69.
[24] Fetter, C.W., 1994, *Applied Hydrogeology*, Third Edition, Macmillan College Publishing Company, Inc., New York, p. 115.
[25] Galloway, D.L., Phillips, S.P., and Ikehara, M.E., 1995, Land subsidence and its relation to past and future water supplies in Antelope Valley, California in *Land subsidence case studies and current research: proceedings of the Dr. Joseph F. Poland Symposium on land subsidence*: Assoc. of Engineering Geologists, Special Publication No. 8., p. 529-539.

On the other hand, groundwater production from one well can have no direct effect on the nature and efficiency of another well, the size and capacity of the pump in another well, or the time of operation of the other well-pump system, other than the effects that may occur due to changes in the groundwater levels in the aquifer, as discussed above. Consolidation of the formation due to lowering of groundwater levels can have a resultant effect on the integrity of wells due to vertical stresses placed on those wells as the result of subsidence. Lowering of the groundwater levels can cause a pump to operate at a lower efficiency and/or at a lower pumping rate, which can result in increased energy costs, increased time of pumping required, and in some instances, increased cost for equipment modifications to meet the changed conditions. All of these effects, however, are caused by changes in groundwater levels, and thus are not separate and distinct effects of groundwater production.

From this assessment, it is clear that the key type of effect that can be produced by groundwater production is the change in groundwater levels in the aquifer. Groundwater levels, and the changes in groundwater levels due to pumping, are all controlled by the physical hydrogeologic properties, hydraulic conductivity and transmissivity, of the saturated geologic materials from which groundwater is produced. Thus, it is important to consider the hydrogeologic properties of the Phase 1 Area.

Regarding Hydrogeologic Considerations

The geologic materials in the general area surrounding the Antelope Valley have been adequately mapped and presented in published reports.[26],[27] The water-saturated geologic materials in the Phase 1 Area, both consolidated and unconsolidated rock formations, can be characterized based on their relative transmissivities and hydraulic conductivities.

[26] Dibblee, T.W., 1967, Areal geology of the western Mojave Desert, California: U.S. Geological Survey Professional Paper 552.
[27] Duell, F.W., Jr., 1987, Geohydrology of the Antelope Valley Area, California, and design for a ground-water-quality monitoring network: U.S. Geological Survey Water Resources Investigations Report 84-4081.

Permeable geologic materials such as highly fractured bedrock and unconsolidated sands and gravels of adequate thickness have relatively high hydraulic conductivities and transmissivities, and are generally able to yield adequate quantities of water to wells.[28] These are the types of formations in which wells are commonly constructed and operated. On the other hand, geologic materials such as unfractured bedrock and fine-grained silt and clay deposits have relatively low transmissivities and hydraulic conductivities, and generally do not yield significant quantities of water to wells.[29] Where these formations are at ground surface or at relatively shallow depths, they significantly limit the construction of wells for groundwater production, and well potential is generally considered infeasible.[30]

Because geologic formations with relatively low transmissivities or hydraulic conductivities are generally considered infeasible for construction of water wells for groundwater production purposes, there is little chance that groundwater production will occur in these formations. Thus, there is little chance that there will be changes in groundwater levels due to groundwater production in these areas. Without changes in groundwater levels, there would be no effect on groundwater production from other wells, either legally adverse or otherwise.

From this information, it is clear that, if a boundary line for the Phase 1 Area is located over materials of relatively high transmissivity and hydraulic conductivity, groundwater production from wells on one side of the boundary could cause changes in groundwater levels in wells on the other side of that boundary. In such an instance, the groundwater production on one side of the boundary may have an effect on the groundwater

[28] US Department of the Interior, 1995, *Ground Water Manual*, a Water Resources Technical Publication, Bureau of Reclamation, Second Edition, U.S. Government Printing Office, Figures 2-4 and 2-4, pp. 28 and 29.
[29] *Ibid.*
[30] *Ibid.*

production from wells on the other side of the boundary. Conversely, if a boundary line is located over materials that have relatively low transmissivity or hydraulic conductivity, there is little or no chance that groundwater production will occur at all, and therefore little or no chance that there would be any effect on groundwater levels on the other side of the boundary. In this instance, there would be no effect due to groundwater production on either side of the boundary, either legally adverse or otherwise.

Based on this analysis, a scientifically-correct method for selecting a line to serve as the Phase 1 Area Boundary is to select a scientifically-based line such that the line overlies geologic materials of relatively low transmissivity or hydraulic conductivity. Watershed or drainage basin boundaries that overly geologic materials of relatively-low transmissivity or hydraulic conductivity would be an example of this type of line, as discussed below.

Regarding Watersheds or Drainage Basins

A watershed or drainage basin consists of all of the land area sloping toward a particular discharge point.[31] The discharge point may be the point at which a stream exits the drainage basin, or a point within the watershed boundary where all of the water accumulates, such as a lake or playa. The boundary of a watershed or drainage basin is the line that surrounds the land area that slopes toward a particular discharge point. The watershed or drainage basin boundary is outlined by surface water or topographic divides.[32] In other words, watershed boundaries are based on the topography of the ground surface, and can be accurately delineated using topographic maps. Also, the exact location of the watershed boundary, at any point along the boundary, can be accurately located in the field using commonly-available land-surveying techniques. Watershed boundaries have been used to define the boundaries of areas for water rights adjudication

[31] Fetter, C.S., 1994, *Applied Hydrogeology*, University of Wisconsin - Oshkosh, Macmillan College Publishing Company, New York, Third Edition, p. 9.
[32] *Ibid.*

in other areas in California, including the Mojave Basin Area Adjudication, the area immediately east of the Phase 1 Area.[33]

By comparing maps of the geologic formations in an area with topographic maps of the same area, the watershed boundaries that overlie geologic materials of relatively-low transmissivity and hydraulic conductivity can be drawn. This method is an appropriate scientifically-based method that can be used in addressing Task No. 5.

Regarding Previously-Adjudicated Areas

Another aspect of the term "legally adverse effect" has to do with whether or not the court in this matter has any interest in addressing the legal rights of property owners in a given area. If an area has already been adjudicated, it means that the rights of groundwater producers in that area have already been addressed by a court of competent jurisdiction. Thus, the overlying land in the previously- adjudicated area is of no concern to this current matter. For example, the Mojave Basin Area, located to the east of the Phase 1 Area in this matter, has been previously evaluated and adjudicated (hereinafter " **Mojave Basin Area Adjudication**").[34,35] I have assumed that the scientific and other methods used in the Judgment after Trial (hereinafter "**Judgment**") for the Mojave Basin Area Adjudication[36] have been appropriately tested as part of that adjudication, and that it is unnecessary to go behind the judicially-defined boundary of the Mojave Basin Area Adjudication to retest the scientific and other methods used to define the boundary of that area. Thus, it is appropriate to accept the judicially-defined boundary of the Mojave Basin Area Adjudication as an appropriate boundary for a portion of the Phase 1 Area

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[33] Superior Court of California, 1996, *City of Barstow, et al., v. City of Adelanto, et al.*, Case No. 208568, Judgment after Trial, Filed January 10, p. 10.
[34] Supreme Court of California, 2000, *City of Barstow et al. v. Mojave Water Agency et al.*, S071728, Ct. App. 4/2 E017881, E018923, Riverside County Super. Ct. No. 208568, Filed August 21.
[35] Superior Court of California, 1996, *City of Barstow, et al., v. City of Adelanto, et al.*, Case No. 208568, Judgment after Trial, Volumes I and II, Filed January 10.
[36] *Ibid.*

Boundary. This, then, is another, appropriate method that can be used to address Task No. 5.

Selected Methods for Defining the Phase 1 Area Boundary

Based on the discussion above, there are scientifically-based and other appropriate methods that can be used to define the Phase 1 Area Boundary such that the Phase 1 Area, so defined, meets the requirements of the Phase 1 Stipulation. These methods are stated below.

- Define a boundary line for part of the Phase 1 Area using a watershed boundary that overlies geologic materials that are of relatively low transmissivity and hydraulic conductivity.
- Define a boundary line for part of the Phase 1 Area using the judicially defined western boundary of the Mojave Basin Area Adjudication.

These two methods adequately and appropriately establish the criteria for defining and delineating the Phase 1 Area Boundary such that the Phase 1 Area, so defined and delineated, fully meets the requirements of the Phase 1 Stipulation.

4. DETERMINATION WHETHER THE BOUNDARIES SHOWN ON PLATE NO. 1 OF THE L&S TECHNICAL MEMORANDUM ADEQUATELY DEFINE AN AREA THAT MEETS THE REQUIREMENTS OF THE PHASE 1 STIPULATION.

As stated earlier in this Letter Report, from a scientific perspective, the requirements of the Phase 1 Stipulation are as follows:

> **Using scientifically-based and other appropriate methods, define the boundary of an area in the vicinity of the Antelope Valley, outside of any adjacent areas within which water rights have been previously adjudicated, and within which claims of water rights will be adjudicated in Phase 2, such that the boundary will appropriately include or exclude overlying properties from the lawsuit, based on the potential for groundwater production effects.**

The boundaries shown on Plate 1 of the L&S Technical Memorandum do not adequately define an area that meets the requirements of the Phase 1 Stipulation for several reasons.

There are several segments of the lines shown on Plate 1 across which groundwater can flow. In these areas, groundwater production on one side of the line can have, and does have, the effect of changing groundwater levels on the other side of the line. These segments include the northern segments of the lines where Mr. Scalmanini has noted that there is groundwater flow across the lines shown. Furthermore, Mr. Scalmanini has also stated that there is groundwater flow across the southern lines shown on Plate 1. In addition, the southeast corner of the areas enscribed by the boundary lines on Plate 1 is described as a groundwater divide, a type of boundary that is noted in the L&S Technical Memorandum to be an inappropriate selection for a basin (or subbasin) boundary.[37]

The boundaries shown on Plate 1 do not appropriately include or exclude overlying properties from the lawsuit. Groundwater production on those properties outside of the north and south boundary lines shown on Plate 1 can have an effect on groundwater production on properties within the area enscribed by the boundary lines.

The boundary lines drawn in the southeast corner of the areas enscribed on Plate 1 include an area that is east of the western boundary of the Mojave Area Adjudication, an area in which water rights have already been judicially determined. It is beyond the intent of Phase 1 to address areas in which water rights have already been adjudicated.

For at least these reasons, the boundaries shown on Plate 1 of the L&S Technical Memorandum do not adequately define an area that meets the requirements of the Phase 1 Stipulation.

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[37] Scalmanini, J.C., 2002a, Technical Memorandum, Ground-Water Basin and Subbasin Boundaries, Antelope Valley Ground-Water Basin, prepared by Luhdorff & Scalmanini Consulting Engineers, Woodland, California, January, p. 3.

5. Determination of the Boundary of an Area that Meets the Requirements of the Phase 1 Stipulation Using the Scientifically-Based and Other Appropriate Methods Selected in Task No. 3.

Exhibit "B" entitled Map of the Phase 1 Area Boundary is a map of the Antelope Valley and the general surrounding area. The base map includes contours showing the topography in the area as well as roads and other cultural features. Superimposed on the base map are lines representing watershed or drainage basin boundaries in the area, a line representing a portion of the western edge of San Bernardino County, and a line delineating the Phase 1 Area Boundary.

Watershed Boundaries

The watershed boundary lines were constructed using a group of 7.5-minute quadrangle topographic maps prepared by the U.S. Geological Survey at a scale of 1:24,000 (1 inch = 2,000 feet). Exhibit "A" lists the maps that were used for this purpose. These maps provide the greatest degree of detail available for the topography of the area. Using the topography shown on the 7.5-minute quadrangle maps, the boundaries of areas that slope toward particular discharge points were drawn. In particular, watershed boundaries were drawn surrounding the Antelope Valley drainage basin, the Fremont Valley drainage basin, and the western portion of the Leona Valley, which is a small, separate drainage basin adjacent to the south watershed boundary of the Antelope Valley.

Mojave Basin Area

The line delineating the western boundary of the Mojave Basin Area Adjudication is shown in Volume II of the Judgment.[38] The western boundary includes segments based on the watershed boundary and segments based on the west line of San Bernardino

[38] *Ibid.*

County.[39] The portions of this boundary line that are watershed boundary lines are the same as the watershed boundary lines shown on Exhibit "B" for this area. The west line of San Bernardino County is also shown on Exhibit "B" for convenience. Along this boundary line there are two small areas that are east of the watershed boundary of the Antelope Valley but west of the western boundary of the Mojave Area Adjudication. These two small areas are not included in the Mojave Area Adjudication.

Hydrogeologic Characteristics

The detailed geology of the area over which the watershed boundary lines of Exhibit "B" are drawn is shown in published maps.[40,41] Hydraulic conductivities and transmissivities of the wide range of geologic materials, including unconsolidated deposits and consolidated rock formations, can be determined from information available in published documents.[42,43] Using the published descriptions of geologic formations and their transmissivities and hydraulic conductivities, the hydrogeologic characteristic of the geologic formations underlying the watershed boundaries were assessed and categorized as either relatively-low transmissivity or hydraulic conductivity or relatively-high transmissivity or hydraulic conductivity. An examination of the geologic materials over which the watershed boundaries are drawn shows that some portions of the watershed boundaries shown on Exhibit "B" overlie geologic formations with relatively-high transmissivity or hydraulic conductivity, while other portions of these boundaries overlie geologic formations with relatively-low transmissivity or hydraulic conductivity.

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[39] *Ibid*, Volume II.
[40] Dibblee, T.W., 1967, Areal geology of the western Mojave Desert, California: U.S. Geological Survey Professional Paper 552, Plates 1 and 2.
[41] Duell, F.W. , Jr., 1987, Geohydrology of the Antelope Valley Area, California, and design for a ground-water-quality monitoring network: U.S. Geological Survey Water Resources Investigations Report 84-4081.
[42] US Department of the Interior, 1995, *Ground Water Manual*, a Water Resources Technical Publication, Bureau of Reclamation, Second Edition, U.S. Government Printing Office, Figures 2-4 and 2-4, pp. 28 and 29.

Defining the Phase 1 Area Boundary

Using the information described above, a combination of the lines shown on Exhibit "B" were found to meet the criteria established by the two selected methods described above in Task No. 3. Exhibit "B" shows the line delineated using these criteria, which is the Phase 1 Area Boundary. The following paragraphs describe the different aspects of the various line segments shown on Exhibit "B", and the bases for selecting the segments that, taken together, make up the Phase 1 Area Boundary.

Segment A-B. This line segment starts at Point A on Exhibit "B" and continues in a generally clockwise direction to Point B. This segment is a portion of the southwestern and western watershed boundary of the Antelope Valley, and is on land that overlies geologic materials that are of relatively-low transmissivity or hydraulic conductivity. For the most part, these materials are bedrock formations of the San Gabriel and Tehachapi Mountains. This line segment meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively-low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment B-E. This line segment starts at Point B on Exhibit "B" and continues generally east and northeast to Point E. This segment is a portion of the north watershed boundary of the Antelope Valley and the south watershed boundary of the Fremont Valley. Portions of this line segment overlie geologic materials of relatively-low transmissivity or hydraulic conductivity, but other portions overlie geologic formations that are relatively high in transmissivity or hydraulic conductivity. The nature of the geologic materials underlying this line segment are such as to allow groundwater to flow beneath portions of the line from one valley to the other, depending on various conditions. As such, this line segment does not meet the scientifically-based criterion of a watershed boundary that

[43] Todd, D.K., 1980, Groundwater Hydrology, Second Edition, John Wiley & Sons, Inc., New York, Figure

overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was not selected as a portion of the Phase 1 Area Boundary.

Segment B-C. This line segment also starts at Point B on Exhibit "B", but generally continues in a northerly direction to Point C. This line is a portion of the western watershed boundary of the Fremont Valley, and is on land that overlies geologic formations of the Sierra Nevada Mountains that are relatively low in transmissivity or hydraulic conductivity. This line meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment C-D. This line segment starts at Point C on Exhibit "B" and continues generally eastward to Point D. This line is a portion of the northerly watershed boundary of the Freemont Valley, and is on land that overlies geologic formations of the Sierra Nevada, El Paso, and Lava Mountains, that are relatively low in transmissivity or hydraulic conductivity. This line meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment D-E. This line segment starts at Point D on Exhibit "B" and continues generally southward to Point E. Point E is the northeastern corner of the watershed boundary of the Antelope Valley drainage basin. This line is a portion of the northeasterly watershed boundary of the Freemont Valley, and is on land that overlies geologic formations of the Rand Mountains that are relatively low in transmissivity or hydraulic conductivity. This

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3.3, p. 72.

line meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment E-F. This line segment starts at Point E on Exhibit "B" and continues in a generally southeasterly direction to Point F. This segment is a portion of the northeastern watershed boundary of the Antelope Valley, and is on land that overlies geologic materials that are of relatively low transmissivity or hydraulic conductivity. This line segment meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment F-G. This line segment starts at Point F on Exhibit "B" and generally continues in a southerly direction to Point G. This line is a portion of the western segment of the judicially-defined boundary of the Mojave Basin Area Adjudication, and consists of a combination of segments of watershed boundary lines and segments of the west line of San Bernardino County. The western boundary-line of the Mojave Basin Area Adjudication intersects the watershed boundary of the Antelope Valley at Points F and G. Along this line segment there are two small areas that are east of the watershed boundary of the Antelope Valley but west of the western boundary of the Mojave Area Adjudication. These two small areas are not included in the Mojave Area Adjudication. To avoid creating a situation in which these two small areas would not be included in either the Mojave Area Adjudication or the adjudication of water rights in this current litigation, these two small areas have been included within the Phase 1 Area. This line segment meets the criteria established for delineation of the boundary of the Phase 1 Area, as discussed in Task No. 3, above. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment G-H. This line segment starts at Point G on Exhibit "B" and continues in a generally westerly direction to Point H. This segment is a portion of the southern watershed boundary of the Antelope Valley, and is on land that overlies geologic materials of the San Gabriel Mountains that are of relatively low transmissivity or hydraulic conductivity. This line segment meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment H-A. This line segment starts at Point H on Exhibit "B" and continues in a generally counterclockwise direction to Point A. This line segment is a portion of the southern watershed boundary of the Antelope Valley, and is on land that partly overlies geologic materials of relatively low transmissivity or hydraulic conductivity, but partly overlies geologic formations of relatively high transmissivity or hydraulic conductivity in the Leona Valley, south of the Antelope Valley. The nature of the geologic materials underlying this line segment are such as to allow groundwater to flow beneath portions of the line from the western portion of the Leona Valley to the Eastern portion of the valley, and vice versa, depending on various groundwater production conditions. As such, this line segment does not meet the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was not selected as a portion of the Phase 1 Area Boundary.

Segment H-I. This line segment starts at Point H on Exhibit "B" and continues in a generally westerly direction to Point I. This line is a portion of the southern watershed boundary of the Leona Valley, south of the Antelope Valley, and is on land that overlies geologic materials of the San Gabriel Mountains with relatively-low transmissivity or hydraulic conductivity. Point I is at the intersection of this watershed boundary and the

creek bed of Elizabeth Lake Canyon, which is the point of surface water discharge for this small watershed, and this line segment defines a portion of the watershed of the Leona Valley upstream of that discharge point. This line meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Segment I-A. This line segment starts at Point I on the map, and continues in a generally westerly direction to Point A (the Point of beginning of the Phase 1 Area Boundary description). This line is a portion of the southern watershed boundary of the Leona Valley, south of the Antelope Valley, and is on land that overlies geologic materials of relatively low transmissivity or hydraulic conductivity in the San Gabriel Mountains. Point I is at the intersection of this watershed boundary and the creek bed of Elizabeth Lake Canyon, which is the point of discharge for this small watershed, and this line segment defines a portion of the watershed of the Leona Valley upstream of that discharge point. This line meets the scientifically-based criterion of a watershed boundary that overlies geologic materials that are relatively low in transmissivity or hydraulic conductivity. Thus, this line segment was selected as a portion of the Phase 1 Area Boundary.

Summary of Phase 1 Area Boundary

Based on the above analysis, the Phase 1 Area Boundary consists of both watershed boundary line segments that overlie geologic materials that are relatively low in transmissivity or hydraulic conductivity and a segment of the western boundary of the Mojave Area Adjudication, a judicially-defined boundary. The watershed boundary portion consists of segments A-B, B-C, C-D, D-E, E-F, G-H, and H-I; the judicially-defined portion consists of segment F-G. These line segments are shown on Exhibit "B",

and taken together, define the Phase 1 Area Boundary, the boundary of the Phase 1 Area, which is an area that meets the requirements of the Phase 1 Stipulation.

PROFESSIONAL OPINIONS

Based on my assessment of the five Phase 1 Tasks identified above, I have formed several professional opinions. The documents and information that I have relied upon, my professional experience, and my personal inspections have provided an adequate basis for me to form professional opinions concerning the Phase 1 issues to a reasonable degree of scientific certainty. The bases for my opinions are summarized in the preceding sections of this Letter Report. The paragraphs below summarize my general opinions.

Task No. 1 Review and critique the L&S Technical Memorandum and the Scalmanini Transcript.

In my opinion, the L&S Technical Memorandum, as discussed in the Scalmanini Transcript, does little more than present, as groundwater basin boundaries, those boundaries previously delineated in published reports that were prepared for specific objectives unrelated to the matters being addressed in Phase 1 of this current litigation.

Task No. 2 Review the Phase 1 Stipulation to develop an understanding of the requirements of Phase 1.

Based on my review of the Phase 1 Stipulation, and my knowledge and experience, it is my opinion that the requirements of the Phase 1 Stipulation are as follows:

> **Using scientifically-based and other appropriate methods, define the boundary of an area in the vicinity of the Antelope Valley, outside of any adjacent areas within which water rights have been previously adjudicated, and within which claims of water rights will be adjudicated in Phase 2, such**

that the boundary will appropriately include or exclude overlying properties from the lawsuit, based on the potential for groundwater production effects.

Task No. 3 Select scientifically-based or other appropriate methods for defining the boundary of an area that would meet the requirements of the Phase 1 Stipulation.

Scientifically-based and other appropriate methods are available that are suitable for use in defining the boundary of an area that meets the requirements of the Phase 1 Stipulation. The two methods selected are:

- Define a boundary line for part of the Phase 1 Area using a watershed boundary that overlies geologic materials that are of relatively low hydraulic conductivity; and
- Define a boundary line for part of the Phase 1 Area using the judicially defined western boundary of the Mojave Basin Area Adjudication.

It is my opinion that these two methods are appropriate and adequate to define the Phase 1 Area Boundary to a reasonable degree of scientific certainty.

Task No. 4 Determine whether the boundaries shown on Plate No. 1 of the L&S Technical Memorandum define an area that meets the requirements of the Phase 1 Stipulation.

In my opinion, the boundaries shown on Plate 1 of the L&S Technical Memorandum do not meet the requirements of the Phase 1 Stipulation.

Task No. 5 Define the boundary of an area that meets the requirements of the Phase 1 Stipulation using the methods selected as part of Task No. 3.

It is my opinion that the boundary line shown on Exhibit "B" as the Phase 1 Area Boundary meets the requirements of the Phase 1 Stipulation to a reasonable degree of scientific certainty.

CLOSURE

I am pleased that Geomatrix Consultants, Inc., has been given the opportunity to provide consulting assistance to you on this interesting project. I trust that this Letter Report will meet your needs.

If you have any questions concerning this Letter Report, or if you need additional services, please call me at (909) 273-7400.

Respectfully submitted,

GEOMATRIX CONSULTANTS, INC.

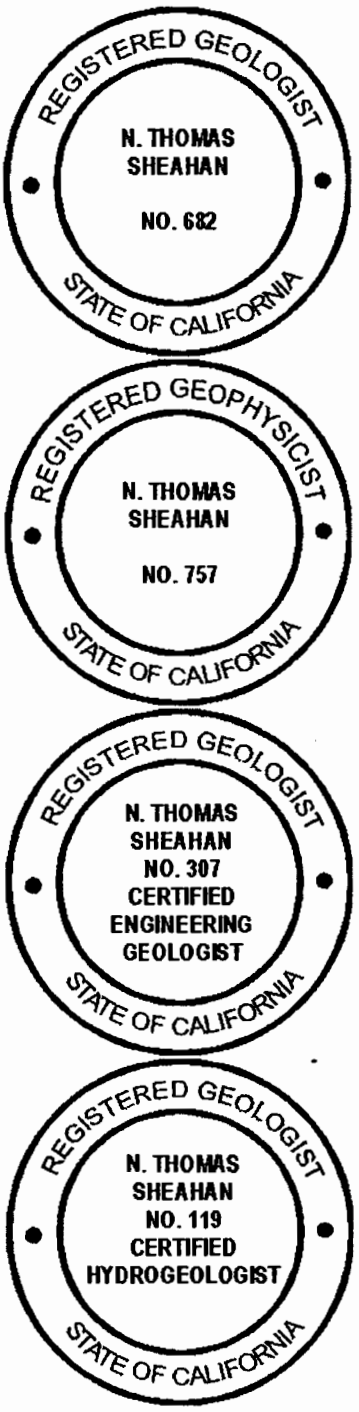
N. Thomas Sheahan, RG, RGP, CEG, CHG
Vice President and Principal Hydrogeologist

Attachments:

Exhibit "A" -- References

Exhibit "B" -- Map of Phase 1 Area Boundary

NTS/s



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