Edward Squires, R.P.G.

EDUCATION

M.S. Interdisciplinary Hydrogeology, 1992, Boise State University, Boise, Idaho.
Advisors: Dr. S.H. Wood (BSU) and Dr. J.L. Osiensky (U of I) advisors.

B.S. Geology, groundwater emphasis, cum laude, 1990, Boise State University, Boise, Idaho.
Advisor: Dr. C. M. White.

Thesis: Hydrogeologic Framework of the Boise Aquifer System, Ada County, Idaho.

REGISTRATION

Registered Professional Geologist, since 1999, Certificate No. 968
Professional Well Log Analyst, since 1995
Certified Water Right Examiner, Certification No. 06-125

OVERVIEW

Ed Squires is the President and Managing Hydrogeologist for Hydro Logic, Inc. of Boise, Idaho. Before starting his own consulting firm in 1999, he served for 6 years as Manager of the Geosciences Department and Senior Project Hydrogeologist for United Water Idaho, Inc. In that capacity, Mr. Squires has consulted on a variety of water resource projects to the United Water Resources group of companies around the United States. He has been part of the adjunct graduate faculty at Boise State University's Department of Geosciences since 1995, regularly teaching a curriculum course in Field Hydrogeology and serving as a guest lecturer for other water-related coursework. Prior to his tenure at United Water Idaho, Mr. Squires worked as a hydrogeologist for S.H. Wood and Associates and has over eighteen years of hands-on groundwater experience.

Mr. Squires' professional career and current practice emphasizes all aspects of responsible groundwater development, water rights, and resource protection. He has conducted extensive research and published several reports on the groundwater and subsurface hydrogeology of the Boise River Valley since publication of his Masters Thesis, entitled "Hydrogeologic Framework of the Boise Aquifer System, Ada County, Idaho". Mr. Squires served three years on the Technical Advisory Committee of the Treasure Valley Hydrologic Project and has been a member of the Southeast Boise Groundwater Management Area Committee, formed as a result of his research in Southeast Boise, since 1994. He recently served on the Technical Advisory Committee for the Hydrogeologic Framework and Computer Modeling Project for the Boise Front Geothermal Groundwater Management Area and has been appointed by the Director to the Negotiated Rulemaking Committee to draft new administrative rules for well drilling in the State of Idaho.

Mr. Squires has designed and supervised the construction of over 300 large bore, high capacity water supply wells averaging 500 feet deep in sedimentary and volcanic aquifers. He has designed, supervised the construction, developed, and tested more than 60 deep (500-to-1000 feet) exploratory test/observation wells in addition to multiple geothermal and irrigation well development projects. In addition to new well installations, Mr. Squires has run down hole camera surveys and borehole geophysical logs in hundreds of wells throughout the Western States and has been in charge of rehabilitative maintenance/reconstruction of over 100 older wells.

Mr. Squires is a registered Professional Geologist (No. 968) and a Professional Well Log Analyst. He is a member of the National Groundwater Association, the Association of Ground Water Scientists and Engineers, and is a Certified Water Rights Examiner in the State of Idaho (05-125).

REPRESENTATIVE PROJECT EXPERIENCE

Groundwater Development

1) Design, construction oversight, development, and testing of over 100 large bore, high capacity production supply wells for public drinking water systems, municipalities, and private utilities.

2) Designed, organized, and supervised 11 regional scale, long-term aquifer tests including those for the State of Idaho Department of Corrections, United Water Idaho, Inc., Water District 63-S, Mesa Water Corporation, Tamarack Resort, and Crane Creek Country Club,

3) Conducted and interpreted borehole geophysical logs in newly drilled wells and provided design information for hundreds of well projects for industrial, commercial, agricultural, and municipal wells in the western U.S.

4) Testing/analysis of United Water Idaho's infiltration galleries (Ranney Collectors) along the Boise River.

5) Pumping test analysis and pumping plant design of municipal supply wells for the Cities of Caldwell, Meridian, and Garden City.

6) Ground water quality and water geochemistry evaluations for the Cities of Meridian, Caldwell, and Garden City, United Water Idaho, Capitol Water Corp., Tamarack Resort, and SSI Food Industries.

7) Hydrogeologic and geophysical investigations for groundwater supply projects for the Idaho cities of Boise, Meridian, Caldwell, Mountain Home, Nampa, Greenleaf, Kuna, Marsing, Buhl, Rupert, Eagle, Cascade, Donnelly, Victor, Star, Emmett, Glenns Ferry, and Notus. Also the Cities of Hawthorne NV, Mt. Vernon OR, LaGrande OR, Island City OR, and Walla Walla WA

Geothermal

1) Water-level monitoring and data analysis of the BWSWD Well #3, Kanta-Yanke, Behrman, Quarryview Park, Koch, and BLM geothermal wells 1984-1987.

2) Water-level monitoring of the Terteling Ranch and Flora Nursery geothermal wells 1993- present.

3) Geophysical investigations of the BWSWD #1 and #2, Kanta, BLM, Terteling (6 wells) Ranch, UWID Cartwright, Crane Creek Country Club, Simplot Ranch, Jeker Ranch wells.

4) Large scale, 11-well aquifer test of the Stewart Gulch geothermal aquifer using the Terteling Windsock well as the pumping well. Basis for IDWR Order changing Water District 63-S boundary (1994).

5) Large scale, long-term aquifer testing of the Stewart Gulch geothermal wells using the Quail Hollow Golf Course well as the pumping well (1993).

6) Six-well, aquifer testing of the Crane Creek area geothermal wells using the Simplot Ranch, Crane Creek GC, and UWID wells as pumping wells. Settled UWID/Simplot water rights dispute – (194-1995).

7) Specific capacity testing of the Flora Nursery and Edwards Nursery geothermal wells 2000-2002.

8) Conducted and interpreted down hole camera surveys of the BWSWD, Flora, Crane Creek Country Club, Terteling Ranch wells.

9) Project manager for design, drilling, completion, and testing of the Peaceful Cove Nursery and Tom Terteling residence deep geothermal supply wells in Stewart Gulch – 1994 & 1995).

10) Project manager for the rehabilitation of the Terteling Ranch Pool, Motorcycle Club, and Windsock geothermal wells – 1990's.

11) Evaluation of historical weir flow data and geothermal water use at Flora Nursery – 1921- 2002.

12) Project manager for reconstruction, and sealing of the Flora Nursery Silkey geothermal well.2001.

13) Co-leader of the Treasure Valley Hydrologic Project Foothills Field Trip to view exposed geothermal aquifer rocks along the Boise Front 1998.

14) Project manager Stewart Gulch seismic profiling project to site, drill, and complete a new cold-water irrigation well above the geothermal aquifer – 1996

15) Conducted geophysical surveys for the J.R. Simplot Co.'s Aquaculture Project in Caldwell, ID.

16) Expert witness for Flora Nursery during protested geothermal Transfer application 2001-2002.

17) Expert witness for The Terteling Company during protested Petition by the City of Boise to increase geothermal water withdraws from the Boise Geothermal Aquifer 2002.

18) Hydrogeologic Framework Refinement and Simulation of Hydraulic Head and Temperature in the Boise Geothermal Aquifer -Technical Advisory Committee member 2002.

19) Co-author of the Boise Front Geothermal Aquifer Monitoring Plan June 2002.

20) Project manager for the geothermal exploration drilling and seismic reflection surveys project at Tamarack Resort 2005.

Aquifer Recharge

1) Project manager for the United Water Idaho, Inc.'s Swift Aquifer Storage and Recovery project (aquifer recharge) in West Boise, Idaho, 1996-1999.

2) Consulting hydrogeologist to United Water Resources for various aquifer recharge projects along the east coast 1996-1999.

3) Geophysical and hydrogeological consultant to the State of Idaho Department of Water Resources' Managed Recharge Project including providing open-hole geophysical logs and borehole video 2000.

4) In-situ Aquifer Storage and Recovery project for dissolved iron concentrations in ground water in the Tamarack Resort municipal supply Well #7 ; successful elimination of iron 2004.

5) Attended two international ARR conferences and two recharge conferences in the US.

Water rights

1) Preparation, filing, and follow-though of numerous water right transfers and water right permit applications and transfers for public utilities, municipalities, the State of Idaho, commercial, and agricultural water users in Idaho.

2) Evaluation of surface water rights and filing of transfer applications in Little Salmon River Valley.

3) Expert witness in Basinwide Issue #5 – Conjunctive Management of Water Resources in Idaho.

4) Expert witness in all manner of water right disputes, protests, and well interference issues before the Idaho Department of Water Resources including groundwater/surface water interactions

5) Evaluations and filing of claims in the Snake River Basin Adjudication.

6) Certified Water Right Examiner in the State of Idaho regularly conducting field licensing examinations and evaluations of pumping systems including determination of historical use.

7) Continual involvement in the interpretation and application of the tenets of the State of Idaho Water Code with respect to groundwater resource development and management.

8) Project manager for United Water Idaho, Inc. concerning the implementation of the 1996 Municipal Water Rights Statute 1994-1999.

9) Successful "Municipal" water rights application for the Idaho Dept. of Transportation for their Issac's Canyon Rest Area near Boise. 1st use of 1996 Municipal Water Rights Statute for the State of Idaho.

10) Co-author of the first successful municipal "future needs' water right application in Idaho.

Groundwater Development Feasibility Studies

1) Design, construction oversight, development, water quality testing , and monitoring of over 50 deep (500-1000 feet) exploratory test-well and piezometer nest installations for municipal and industrial water providers in Southwest Idaho..

2) Groundwater Feasibility Study For Idaho Power Co.'s Pahsimeroi Fish Hatchery, Lemhi, County, Idaho.

3) Reconnaissance Level Groundwater Feasibility Study for the Idaho Power Company's Oxbow Fish Hatchery atv the Confluence of Pine Creek With the Snake River in the Hells Canyon Reach, Baker County, Oregon.

4) Hydrogeologic Evaluation of Groundwater Quality and Yield Beneath the Idaho Power Company's Pahsimeroi Fish Hatchery – Upper Facility.

5) Analysis of the 2001 Aquifer Testing for the Municipal Water Supply of the Proposed WestRock Resort, Donnelly, Valley County, Idaho.

6) Groundwater Conditions and Hydraulic Testing of the Boise Fan-Aquifer of Southeast Boise River Valley, Ada County, Idaho.

1) Evaluation of the Hydrogeologic Framework and Groundwater Production Potential of the Kings River Valley, Nevada.

Resource Protection

1) Investigation, design and oversight of the decommissioning and proper abandonment of 35 aging and unsealed large-bore production well using perforate-and-pressure grouting techniques.

2) Design and oversight of the pressure grout sealing and rehabilitation of four high-yield unsealed wells.

3) Development and implementation of a baseline (pre-development) surface water quality monitoring plan for the proposed Tamarack Resort, Donnelly, ID.

EMPLOYMENT

1999-present	President and Managing Hydrogeologist; Hydro Logic, Inc.
1994-1999	Sr. Hydrogeologist (RPG) United Water Idaho, Inc.; Geosciences Department Head.
1995-present	Adjunct graduate faculty; Boise State University Department of Geosciences.
1992-1994	Consulting Hydrogeologist. S.H. Wood and Associates, Boise, Idaho.
1990-1993	Staff Technician; Geophysical Well-logging Unit, Boise State University.
1989 summer	Idaho Geological Survey; Idaho Initiative. Albion Range field-mapping.
1989	Internship; Boise Water Corp.; Digital Data Acquisition for Groundwater Studies.
1988 summer	White/Naslund National Science Foundation Research Expedition to Kangerslugsuaag region of arctic East Greenland. Team member in charge of field mapping.
1987 summer	Research assistant at BSU on hydrogeological studies. Design, construction, and operation of Boise State University's truck-mounted geophysical well-logging unit. Thin-section and X-ray diffraction laboratory manager.

PUBLICATIONS AND REPRESENTATIVE PROFESSIONAL REPORTS

Movement of Dissolved Constituents From Surface to Groundwater and Analysis of Hydrochemical Trends in the Boise Aquifer, 2006, research paper in preparation with D. Glanzman.

Baseline Surface Water Quality Estimation For Streams In the Tamarack Resort Area, Donnelly, Valley County, Idaho: 2006, a four-year study to develop baseline geochemical signatures and annual flow rates/volumes for six area streams using the Probability Plot Analysis method.

Hydrogeologic Evaluation of the Feasibility for Ground Water Development Beneath the Miller Gulch Area of the Terteling Ranch in the Boise Foothills, Ada County, Idaho With Emphasis on Water Quality / Geochemistry: 2005, a report on the drilling, design, construction, and sampling of the Miller Gulch exploratory test-well bore and piezometer nest.

Options for Additional Ground Water Development and Replacement of the City of Caldwell's #7 Supply Well: 2005, a report on the drilling, design, construction, and sampling of an exploratory test-well and long-term dedicated piezometer nest/monitoring well at the City of Caldwell's existing municipal water supply well site, prepared for the City of Caldwell, Idaho Department of Public Works.

Boise Valley Groundwater Geochemistry – Origin, Infiltration Rate, and Transport Characteristics: 2005, abstract submitted to the 15th Annual Goldschmidt Meeting of international geochemists, co-author with Dick Glanzman, CH2M Hill Denver.

Treasure Valley Hydrologic Project Seismic Survey and Hydrogeologic Framework Study, 2003, research paper in preparation with Dr. S.H. Wood, and Lee Liberty of BSU.

Compilation of Drilling, Geological, Geophysical, Geochemical, and Hydraulic Testing Data for the City of Meridian, Idaho's Groundwater Supply; Including Detailed Well-Construction Information and Aquifer Pressure Measurements From a Long-Term Groundwater Monitoring Well Network, 2003, data compilation from a ten-year hydrogeologic study funded by the City of Meridian.

City of Meridian, Idaho Source Water Protection Plan: 2003, prepared for the Idaho Department of Environmental Quality and the City of Meridian Department of Public Works.

Details of Drilling, Construction, and Hydraulic Testing of the Idaho State Correctional Institution #4 Supply Well, 2002, a report prepared for the Idaho Division of Public Works.

Results and Analysis of the 2001 Aquifer Testing for the Municipal Water Supply of the Proposed WestRock Resort, Donnelly, Valley County, Idaho: 2002, A report prepared for the Idaho Department of Water Resources.

Causative Factors of Detachment of the Mountain Home #1 Municipal Supply Well Pump With Details of the Recovery Effort: 2002, A report prepared for Ringert Clark Chartered Lawyers.

Evaluation, Abandonment, and Proposed Replacement of the Capitol Water Corporation's #5 (Lubkin) Municipal Supply Well 1999-2002: 2001, A report on the history of repair, the occurrence of volatile organic compounds, and the abandonment of an aging supply well in preparation for replacement of the #5 well with a new facility.

Preliminary Evaluation of the Well Construction, Present Down Hole Conditions, and Sustainable Yield of the Garden City #5 Municipal Well: 2001, A report the Garden City Public Works Department.

Stratigraphic Studies of the Boise (Idaho) Aquifer System Using Borehole Geophysical Logs With Emphasis on Facies Identification of Sand Aquifers: 2000, Report to the Treasure Valley Hydrologic Project, Idaho Department of Water Resources, (co author with Dr. S.H. Wood).

Hydrogeology, Geochemistry, and Well Construction of the Treasure Valley Hydrologic Project Monitoring Well #1, Ada County, Idaho: , 1999, Final report to the Technical Advisory Committee (co-author).

Supporting Data for the Groundwater Conditions and Aquifer Testing of the Tenmile Ridge Area of South Boise, Ada County, Idaho: 1998.

Implications of Well-Construction to Aquifer Water-Quality: Some Observations: (principal author), 1997, Southwest Idaho Subsection – Pacific Northwest Section of the American Water Works Association; in Southwest Idaho As An Example of Ground Water Development in the Northwest Intermountain Region, Speakers Expanded Abstracts

City of Meridian #15 Production Well: Discovery of a New, Good-Quality Aquifer: 1994, Professional report to the City of Meridian, Idaho.

Groundwater Conditions and Hydraulic Testing of the Boise-Fan Aquifer of Southeast Boise River Valley, Ada County, Idaho: 1993, Report to Boise Water Corporation. (principal author).

City of Meridian #14 Production Well: 1993, A new large-capacity municipal-supply well is completed in response to unprecedented 18% growth. Report to City of Meridian, Idaho.

Hydrogeologic Framework of the Boise Aquifer System, Ada County Idaho: 1992, Project Completion Technical Report, Idaho Water Resources Research Institute, University of Idaho, Moscow, Idaho, 109 pages. (principal author)

An Irrigation Well for the Les Bois Invitational Soccer Tournament Incorporated, 1992, professional report to Boise Water Corporation, 42 pages. (sole author)

Hydrogeologic Investigation for the Proposed State of Idaho, Department of Transportation Blacks Creek Rest Area, Ada County, Idaho: 1992, report to Idaho Department of Transportation, 38 pages. (principal author)

Investigation of Groundwater in the Tenmile Ridge Area of South Boise, Idaho: 1989. Report to Boise Water Corporation. (principal author)

Origin of Granophyres in the Vandfaldalen Macrodike, East Greenland: 1989, Evidence for Assimilation and Magma Mixing. GSA Abs. with Programs. (co-author)

Crustal Assimilation and Coexisting Silicic and Mafic Magmas in the Vandfaldalen Macrodike, East Greenland: Continental Magmatism Abstracts (IAVCEI): New Mexico Bureau of Mines and Mineral Resources Bulletin 131. (co-author)

Analysis of Historical and Current Water-level and Production Data from the Boise Geothermal System: 1988, Geological Society of America Abstracts. (co-author)

Preliminary Geology and Hydrogeology of the Mayfield/Orchard Area, Elmore and Ada Counties, Southwest Idaho: 1988, (Best Undergraduate Paper in Physical Sciences), in Program and Abstracts, 30th Annual Meeting of the Idaho Academy of Science. (sole author)

Geologic Study of Groundwater in Deep Wells, Southeast Boise Area: 1987. Report to Boise Water Corporation.

Summary of Principal Opinions, Data, and Exhibits

Ed Squires
Hydro Logic, Inc.
November 26, 2008

Background information and opinions.

1. My resume is attached. I am the owner of Hydro Logic, Inc. ("HLI"), a consulting firm specializing in hydrogeology. I have 22 years of experience conducting ground water analyses, designing and testing water wells, and studying the subsurface geology in the Ada, Canyon, and Gem County areas of Idaho. My 1992 Master's thesis focused on the hydrogeologic framework of the Boise aquifer system. I have been fortunate to have two of southern Idaho's pre-eminent geologists, Dr. S.H. Wood (Boise State University professor emeritus) and the late Willis Burnham (USGS retired) as my mentors in studying the exposed outcrop geology of the local foothills and the history of depositional processes for the resultant stratigraphy of this area.

2. I have personally designed, supervised the construction of, and tested at least 200 large water supply wells (most of which have been in the Treasure Valley), at least a few dozen smaller diameter water supply wells, and more than 50 deep exploratory wells including many that have been completed as long-term designated piezometer nest monitoring stations. I have collected information from many more wells that I did not construct, and have monitored ground water levels in many wells during all of this time. I have personally measured water levels in hundreds of water wells, and have conducted down-hole camera surveys of hundreds of wells in the intermountain west.

3. I routinely conduct geophysical and lithologic logging of wells using several techniques, and am very familiar with the interpretation and use of such logs. I have reviewed many thousands of well driller reports, in Idaho and elsewhere, and compared them to geophysical data in several hundred instances. In my opinion, driller's reports most often do not provide an accurate depiction of the subsurface drilled geologic section. While driller reports are somewhat useful and important in providing general information about a well or a well bore (such as its date drilled, its depth, its drilling method, casing length, and any attempt at sealing), and sometimes can provide some evidence for explaining why a given well behaves the way it does, these records are generally incomplete and uneven in quality such that more rigorous evaluation usually is needed to determine actual characteristics of a well or the subsurface it penetrates.

4. I have been involved with several seismic investigations and other geophysical surveys of subsurface geology in the Treasure Valley. I am familiar with the general use of seismic equipment, and have consulted on the interpretation and correlation of seismic analysis in various types of geologic settings.

5. I have a great deal of experience in water well drilling techniques and the methods needed to seal wells against leakage between aquifers and from surface land use activities. I have observed many times, and often am asked to help solve, problems well owners encounter due to such things as poor well construction, inefficiency, improper

well completion, improper screening, lack of well seals, invasion of various types of bacteria, and other issues.

6. I have conducted hundreds of well tests and at least a dozen large-scale regional aquifer tests which have involved pumping properly-constructed and examined wells to determine a variety of things such as effects on aquifer pressures, movement of water in the subsurface, aquifer boundary conditions, aquifer coefficients, and effects on recharge and discharge. I have assisted in the construction and use of ground water models in my work, and have consulted on the construction of models by others. I frequently use geochemical analyses in my work.

7. Most domestic and irrigation wells in the Treasure Valley (and elsewhere in my experience) are not sealed, and most often (in my opinion) are not properly constructed or completed. Water level measurements from such wells, while useful for limited purposes and a necessary data point in a thorough study, can yield data that inaccurately portrays ground water conditions or well interference effects. For example, a well bore that is open outside the casing to three separate water-bearing zones usually will not provide an accurate water level of any of the three. A well casing that has corroded through (another common problem, especially with thin-wall steel casings) usually will defeat any common casing seals that may be in place. A well that fills with sand due to improper screen or perforation sizing will yield water level and drawdown profiles that are different from an adjacent well that does not have this problem. Sand-producing wells also often create voids outside the casing that can result in caving of overlying materials that can then clog screens and impede water flow into the well. Nevertheless, measurements of water levels in such wells cannot be avoided because they are most often all we have to work with.

8. Each of the domestic and irrigation wells of the Protestants in this case, based on the Protestants' Questionnaires and Well Driller's Reports I have reviewed, is an unsealed well. In my opinion, most, if not all, of these wells are of poor-quality construction.

Hydrogeological Investigations and Opinions Relative to the M3 Eagle Water Right Application

Several of my opinions in this matter are based on extensive hydrogeological investigations, analyses, and data collection undertaken by HLI or others pertaining to water supply for the proposed M3 Eagle planned community. These efforts include the following:

9. HLI measured the Aquifer's surface and gradient.
    a. June 2006: researchers and graduate student interns at the University of Idaho, working under contract to HLI, measured ground water levels in 169 domestic wells in the Eagle area.

    b. June 2007: HLI reviewed records of these domestic wells and selected a group of them for re-measurement. The selection was based on those wells that are better constructed and completed into the Pierce Gulch Sand Aquifer. On this basis, ground water levels in 57 wells were measured again.

c. August 14-16, 2007: To confirm accuracy of measured ground water levels (and thus, aquifer gradients); HLI hired a professional surveyor to determine well head elevations of these 57 wells to survey-grade accuracy (within).

d. March 7, 2007: HLI compiled this measurement data, produced a contour map based on it, and submitted both to IDWR.

e. March 19, 2007: HLI provided a Technical Memorandum to IDWR describing and enclosing the ground water contour map.

f. Data from all of the above well measurements have been provided to IDWR and posted to the Department's North Ada County ("NAC") website.

This information shows that ground water within the Pierce Gulch Sand Aquifer ("Aquifer") flows northwest from the Boise River Basin to the Payette River Basin.

g.

Baseline, pre-M3 Eagle water level measurements now exist for domestic wells in the area from which to gauge future changes in the Aquifer.

10. On behalf of M3 Eagle, HLI began a monitoring network in M3 Eagle area on May 5, 2006 and is now monitoring 23 wells in the area, including multiple piezometer nests.

11. Each of the 23 observation wells has been designed and constructed so that it could be used for long-term monitoring. For example:

    a. Each existing well bore was cleaned, re-habilitated, and inspected with a down-hole camera to ensure it will provide meaningful monitoring data.

    b. Each newly constructed piezometer within the exploratory bores is fully developed, sealed, and equipped with a separate digital data logger that continuously measures water level and barometric pressure; this data is downloaded monthly.

    c. Each piezometer also is measured by hand monthly to calibrate and double-check the digital data logger.

12. HLI has obtained and reviewed all other available water level monitoring data in the area maintained by the U.S. Geological Survey, IDWR, and United Water Idaho, Inc.

13. M3 Eagle also measured water levels in Eagle Water Company wells, City of Eagle wells, and United Water Idaho wells in the Eagle area.

14. Accordingly, M3 Eagle has over two years of ground water level measurements from its own monitoring network. This provides a further baseline against which to measure future pumping effects and to check the accuracy of ground water modeling.

15. Existing data show no significant decline of aquifer pressures or ground water levels in the Eagle area over the last ten years, despite steadily increasing ground water development in the area.

16. M3 Eagle contracted with Boise State University's Center for the Geophysical Investigation of the Shallow Subsurface ("CGISS") to conduct seismic reflection surveys on M3 Eagle property in Big Gulch during July 2006 (led by Director John Chapman).

    a. CGISS and students and faculty in BSU's Department of Geological Sciences conducted approximately 25 miles of magnetometer surveys during the summer of 2006 (led by Dr. Paul Donaldson and interpreted by Dr. S.H. Wood).

    b. Seismic reflection profiling of the subsurface was of limited success, but magnetometer surveys detected and confirmed structural faulting that HLI also has described through its work, including in HLI's May 2007 Report attached as Exhibit 4 to Attachment A of the M3 Eagle Second Amended Water Right Application ("HLI 2007 Report").

17. M3 Eagle contracted with the University of Idaho's Geosciences Department in June 2006 to develop a computer model of the ground water system for North Ada County. M3 Eagle funded a Masters Thesis as part of this effort.

    a. This was done in response to a request by the North Ada County Foothills Alliance ("NACFA"), a citizens group concerned about development in the Eagle area.

    b. U of I geology graduate student Stacey Douglas, working under Dr. James Osiensky, completed the model and report in December 2007.

    c. U of I post-doctoral researcher Dr. Robin Nimmer contributed to water budget analyses for the Douglas/Osiensky model.

    d. The December 2007 Master's Thesis model report is available on the NAC website.

    e. The U of I Master's Thesis model report supports the description of the hydrogeological basin in the HLI 2007 Report. The model report also confirms that, in the area it reviewed (which includes the M3 Eagle planned community area of the foothills north of Eagle) ground water flows toward the Payette River Basin.

18. During the past two and a half years, and in addition to the work described above, HLI conducted hydrogeologic framework studies and carried out an exploratory drilling program consisting of the following principal elements:

    a. HLI reviewed every available Well Driller's Report for the area, a total of over 3,000 records.

b. During August 2006, HLI used more than 70 of the better quality driller's reports from area wells to develop 12 draft sub-surface cross-sections of the Eagle-area subsurface. Quality was evaluated based on HLI's familiarity with the well in question, with the driller, and with observed conditions or other data that validated entries in the driller's reports.

c. Between September 2006 and April 2008, M3 Eagle drilled four exploratory test wells (ranging from 800 to 1,000 feet deep), sampled the geologic section, and geophysically logged the open bores before completing these as multi-level piezometer nests for long-term monitoring (the same piezometers that are discussed above).

d. HLI produced composite diagrams showing the geological, geophysical, geochemical, hydraulic, and well construction data for 13 existing wells of significance and for which good-quality data were available. HLI's July 4, 2008 report containing these composite diagrams was submitted to IDWR and is posted on the NAC website.

e. HLI obtained borehole geophysical records dating back over fifteen years from a number of entities and used these to map the 3-D geometry of the base of the Pierce Gulch Sand Aquifer in the M3 Eagle area. The HLI 2007 report contains HLI's preliminary findings from this effort.

f. This information, in concert with other deep well data and geophysical records within the Boise and Payette basins from petroleum exploration projects, supports HLI's conclusion in 2007 that the Pierce Gulch Sand Aquifer, which has been mapped in three-dimensions, is regionally extensive and highly productive.

g. The Pierce Gulch Sand Aquifer is so named because it consists of the extensive layer of lake-deposited sands first identified and described as the "Pierce Gulch Sand" in the research reports by Dr. S. H. Wood of BSU.

h. Since HLI completed the cross-sectional analysis described here, it has obtained additional geophysical logs from three additional deep well drilling projects conducted by oil companies in the Boise and Payette Valleys. This additional information shows that the Aquifer extends at least as far as Payette to the northwest, Boise to the south east, and Caldwell to the west.

i. Based on this data, HLI has constructed four additional cross-sections of the Aquifer within the Boise basin that traces it from across the M3 Eagle site and into Eagle, Star, and West Boise.

19. Working with Pacific Ground Water Group ("PGG") of Seattle, Washington, M3 Eagle, LLC recently completed its own numerical, three-dimensional ground water model of the Aquifer ("PGG Model") and conducted several simulations using it.

a. Developing this model first involved review of four existing ground water models for the basin. These include 1) the Lindgren Model, 2) the Newton Model, 3) the TVHP Model, and 4) the U of I Model.

b. PGG Model predictions were based upon an assumed pumping rate within the M3 Eagle planned community of approximately 16 cfs; pumping full-time year-round.

c. The PGG Model was the first that has been able to duplicate (i.e., calibrate to) the data from the Lexington Hills and Eaglefield aquifer tests (both discussed in 16 Aquifer Test report described below).

d. The model also successfully predicted (i.e., calibrated to) the results of the Spring Valley Ranch Well #7 aquifer test (discussed below) conducted by HLI in winter 2008.

e. The PGG Model shows that simulated ground water pumping (at ~10% above the average annual projected withdrawal rate for the M3 Eagle project at full build-out) is projected to cause Pierce Gulch Sand Aquifer drawdowns of 10 to 15 feet within ½ mile of M3 Eagle's property boundary after 50 years of continuous pumping. Drawdowns in shallower zones are predicted to be less. Within a mile, drawdown is projected to be about 5-to-12 feet after 50 years. In my opinion, these are reasonable predictions, and are supported by the other evidence described herein.

20. HLI conducted two aquifer tests as part of its study of the Aquifer and M3 Eagle's likely effects on ground water levels.

a. Kling Well Aquifer Test.

i. HLI reconstructed, redeveloped, and inspected this supplemental irrigation well during the summer of 2006.

ii. HLI conducted a 48-hour aquifer test of the Kling irrigation well January 9-11, 2007, pumping it at 900 gpm.

iii. HLI monitored 15 observation wells, but effects were observed only in the nearest M3 Eagle monitoring well (M3 TW-#1) approximately 1,050 feet away, where approximately 9 feet of drawdown was measured.

iv. This aquifer test provides strong evidence that large production wells of excellent ground water quality can be completed in Big Gulch area.

b. Spring Valley Ranch Well #7 Aquifer Test:

i. HLI redeveloped and inspected the Spring Valley Ranch test well #7. This well was drilled under the supervision of SunCor's consultants (Scanlan Engineering) in March and April of 2004.

ii. Between March 10th and March 19th of 2008, HLI conducted a 9-day aquifer test at a continuous discharge of 907 gpm.

iii. HLI took water level readings throughout the test in 22 observation wells.

iv. IDWR was informed throughout and participated in some of the test planning and monitoring.

v. HLI measured drawdowns on the order of 0.1 foot in wells in the Aquifer two miles away after 9 days of continuous pumping.

vi. HLI tested the water quality in the well.

vii. From this test, HLI concludes that the Pierce Gulch Sand Aquifer contains excellent ground water quality, suitable for all municipal purposes without treatment. The test is strong evidence of the aquifer's extensiveness and productivity. The test produced no hydraulic response in the Willow Creek Aquifer to the east, and supports the conclusion that the two aquifers are separate geologic formations without a significant hydraulic connection.

21. HLI's re-analysis of 16 previous aquifer tests.

a. Beginning in December of 2007, HLI re-analyzed the data and findings from sixteen previous aquifer tests in light of the new conceptual model as reflected in the HLI 2007 Report. The purpose was to determine whether these past test results are consistent with HLI's current findings.

b. Based on this work, HLI produced its July 4, 2008 report entitled "Re-Analysis of 16 Aquifer Tests in the Greater Eagle-Star Area of North Ada County, Idaho," which has been reviewed by Dr. Osiensky of U of I (the "16 Aquifer Test Report").

c. HLI provided the 16 Aquifer Test Report to IDWR and it was placed on the NAC website.

d. Based on the16 Aquifer Test Report and other evidence, HLI concludes that the Aquifer is a leaky, semi-confined system having some interconnection to shallower ground water on the east side of Eagle, and it has more transmissivity, thickness, and productivity than described in previous consultant's reports.

e. The 16 Aquifer Test Report supports the conceptual model of the Aquifer described herein and in the HLI 2007 Report.

22. Geochemical testing. HLI obtained ground water geochemistry samples from M3 Eagle's exploratory test wells at 15 separate aquifer depths and had them analyzed at Alchem Laboratories in Boise. These geochemical analyses were sent to Richard Glanzman of Glanzman Geochemical in Lakewood, Colorado for interpretation. Mr. Glanzman's

analytical results of the geochemistry have been posted to the IDWR's NAC web-site and HLI will provide the final report from the HLI/Glanzman geochemistry study when it is completed. This report also will be posted on the NAC website.

23. Peer review, agency involvement, and public dissemination of data:

    a. HLI has included Boise State University and the University of Idaho in its studies. As noted, experts from both universities have reviewed HLI's documents and concepts.

    b. Dr. S.H. Wood's decades-long geologic surface mapping, surface and borehole geophysical surveys, and structural studies of the Boise Foothills and Boise Basin were incorporated into M3 Eagle's investigations. Dr. Wood was consulted and included in several field trips evaluating the geology and depositional setting of the area.

    c. At M3 Eagle's direction, HLI has informed IDWR of all of its findings and data, as it is developed, and included IDWR hydrogeologists on field trips (at least four such trips to date).

    d. M3 Eagle has supported and contributed information and comment to the IDWR's newly formed North Ada County Technical Working Group; HLI is a contributing member of that group.

    e. M3 Eagle has shared HLI's aquifer research through public presentations to the Idaho Association of Professional Geologists, Boise State University, City of Eagle City Council, City of Eagle Planning and Zoning, Eagle Mayor's Citizen's Water Committee, North Ada County Foothills Association, Farmer's Union Ditch Co., IDWR North Ada County Technical Working Group, Representative Mike Moyle, Senator Brad Little, United Water Idaho, Holladay Engineering, IDWR's Technical Services Bureau, and NACFA.

    f. All research to date, peer-review, and scientific collaboration has further supported HLI's conceptual model for the ground water system in the Eagle area; no data has contradicted HLI's conclusions.

24. M3 Eagle's Projected Well Field

    a. Simulations using the PGG numerical ground water model are currently being used to model a revised number of wells (fewer) in the center of the planned community.

    b. It is likely that three or four centrally-located production wells, each pumping an average of 1,500 gpm, will form the core of M3 Eagle's production.

    c. Pumping effects from M3 Eagle's wells are now envisioned to be more distant from many existing water users' wells with the newly proposed wells locations

being separated from the current Eagle city boundary by approximately a mile of undeveloped federal land administered by the BLM.

d. Higher capacity production wells with less drawdown are now believed to be possible at M3 Eagle than were initially envisioned in the HLI 2007 Report.

25. Recharge to M3 Eagle's Proposed Well Field

a. A preponderance of scientific evidence, from several separate fields of study, support the conclusion that the sand aquifers underlying the M3 Eagle site are hydraulically connected to, are part of, and are recharged by the greater regional aquifer, and that this regional aquifer is the Pierce Gulch Sand Aquifer. I am unaware of any observed or measured data, or any geological fact, that contradicts these conclusions.
b. The Treasure Valley Hydrologic Project ("TVHP") Report assumed an aquifer boundary at the base of the foothills, essentially beneath the alignment of the Farmers Union Ditch, and did not attempt to characterize the thickness, dip, or geologic origin or extent of the Aquifer. To the extent one would attempt to infer that the Aquifer terminates at the base of the foothills, or is not recharged by the Boise River and associated water sources, the TVHP Report contains no evidence to support such an inference.
c. Separate lines of evidence support the conclusion that the Aquifer receives robust recharge from the Boise River system. These include: 1) ground water monitoring data, 2) ground water geochemistry data and analysis, 3) borehole geophysical logs and interpretation, 4) hydraulic testing, and 5) computer modeling.

26. Discharge of Boise Basin Ground Water to the Payette Basin:

a. A preponderance of scientific evidence, from several separate fields of study, support the conclusion that the ground waters within sand aquifers underlying the M3 Eagle site are hydraulically connected to and discharge to sand aquifers in the Payette Basin.
b. The separate lines of supporting evidence for ground water discharge from the Boise River basin to the Payette River basin include: 1) ground water monitoring data and numerous hydraulic gradient measurements, 2) observable facts pertaining to the depositional environments and physical outcrop geology between the two basins, 3) correlation of borehole geophysical logs from the site with those within the Payette Basin, 4) ground water flow maps of previous workers (USGS), and 5) computer modeling.
c. Although I conclude that substantial amounts of ground water flows from the Boise Basin to the Payette Basin, such an exchange is not required to substantiate the availability of ground water under the M3 Eagle property nor the interconnection to recharge sources in the Boise Valley. In other words, even if the ground water flow from the Boise Valley to the M3 Eagle site were to return to the Boise Basin, it would have no material effect on the recharge source or the conclusions as to the amounts of water available or the effects of producing it.

Other Technical Opinions Relative to the M3 Eagle Water Right Application

27. Borehole Geophysics:

- **a.** Measured borehole geophysical logs clearly show a characteristic geophysical signature of the Pierce Gulch Sand from M3 Eagle to the Boise Valley. In my opinion, this conclusively proves that the sand aquifer is continuous from well into the foothills on the north to the Boise Valley aquifer system extending under Star, Eagle, Meridian, and Boise.
- **b.** I have personally run the geophysical logs used for correlation, or have obtained these from a geophysicist trained by me and running the logs at my direction and using the same equipment. I have full confidence in the accuracy of these calibrated geophysical logs.

28. Water Level Monitoring:

a. HLI's monitoring of 22 wells in the area for approximately two years shows a hydraulic connection from the Pierce Gulch Sand Aquifer under M3 Eagle to the main valley aquifer system under Eagle, Idaho.
b. Pumping events are visible in M3 wells that are also evident in Eagle-area wells.
c. Regional scale drawdown and recovery events evident in valley and M3 Eagle wells show that the M3 Eagle and valley wells are hydraulically interconnected and strongly recharged by the same systems.
d. Measured ground water contours strongly suggest that ground water moves from the Boise Basin to the Payette Basin.
e. The movement of ground water from the Boise Basin to the Payette Basin has been evident for many years by a number of researchers.
f. Significant water level declines are not occurring in the Eagle area.

29. Hydraulic Testing:

- **a.** Based on experience with the design and testing of over 250 large capacity wells in the area, in concert with the data we have compiled about the aquifer system under the M3 Eagle site, I conclude that high-yield wells capable of 2,000-to-3,000 gpm are possible on the M3 Eagle site.
- **b.** The Aquifer is very productive with high transmissivity values.
- **c.** We have tested two small-bore wells on the M3 property that have sustainable yields of approximately 1,000 gpm.

30. Ground Water Geochemistry:

- **a.** The ground water chemistry of the M3 Eagle wells completed into the Aquifer is very nearly identical to the wells in the Valley near Eagle.
- **b.** The ground water geochemistry of the Aquifer is significantly different from that of the Willow Creek Aquifer.
- **c.** I agree with findings by other researchers (SPF Engineering) that the Willow Creek Aquifer, which is in a geologic setting adjacent and similar to that of the Pierce Gulch Sand Aquifer, also has ground water flow toward the Payette basin.

31. Other Professional Opinions:

- **a.** The regional Pierce Gulch Sand Aquifer is continuous from the subsurface under Boise and Eagle to the foothills area underlying M3 Eagle.

b. My understanding of the principles of geologic sedimentation and stratigraphy, in concert with over 20 years of hydrogeologic and geologic observations and testing in the Boise and Eagle foothills, support my conclusion that the Pierce Gulch Sand Aquifer should extend over a large area. Exactly how extensive the aquifer actually is cannot be known without further data and testing.

c. The ground water withdrawals proposed by the M3 Eagle development are reasonable with respect to quantity and I would not expect them to have an adverse effect on existing wells and/or water users.