BEFORE THE DEPARTMENT OF WATER RESOURCES

FOR THE STATE OF IDAHO

IN THE MATTER OF APPLICATION FOR PERMIT NO. 63-32573, IN THE NAME OF THE CITY OF EAGLE[1]	)))	**SECOND AMENDED FINAL ORDER**

THIS SECOND AMENDED FINAL ORDER SUPERSEDES AND REPLACES THE AMENDED FINAL ORDER DATED JANUARY 25, 2010.

Background

On November 21, 2006, M3 Eagle, LLC ("M3 Eagle" or "M3") filed with the Idaho Department of Water Resources ("Department" or "IDWR") an application to appropriate water seeking to appropriate 42.5 cubic feet per second ("cfs") from ground water for municipal purposes. On August 27, 2007, M3 Eagle filed an amended application to appropriate water. The amended application sought to appropriate 27.47 cfs from ground water for municipal purposes. On April 22, 2008, M3 Eagle filed a second amended application to appropriate water. The second amended application seeks to appropriate 23.18 cfs of ground water for municipal purposes. In addition, the application seeks a diversion to storage rate of 2.93 cfs and a diversion from storage of 1,660 acre-feet of water. The application also states that 1,836 acre-feet of water will be stored in ponds on the proposed development.

The applications to appropriate water were assigned water right no. 63-32573. Notice of the second amended application was published statewide on May 1 and 8, 2008. A large number of individuals and entities filed protests against the application.

Many of the protestants agreed to be represented at the hearing by spokespersons. The following protestants identified David Head, John Thornton, or Ann Ritter, officers in the North Ada County Groundwater Users Association ("NACGUA"), as spokespersons to speak for them in the above contested case and during the hearing for the contested case: John L. Thornton, Linda D. Burke, John Franden, Craig Tarbet, Sherri Randall, Charles Watkins, Robert H. West, Stephen Dick, Bruce Van Camp, Loring Evans, Thomas Ritter, Lorn H. Adkins, Daniel J. Glivar, Richard Lagerstrom, Vince Iazzetta, Dale Gaston, Marion D. Groothuis, Vincent J. Minkiewicz, Carol Jean Thompson and/or John Petrovsky, Barb Jekel, Robert Lyons, G. E. McDonald, George W. Keyes, Eric C. Leigh, Shelby Conrad, Morgan Masner, Jim Banducci, Jr., Steven C. Purvis, Robert S. Niccolls, Jr., David Collett, Walter H. Meyer, Jr., Michael McMurray, Lyle Jordan, Ronald R. Rapp, Bruce Richardson, and Barrett D. Jones.

[1] The original caption was changed to reflect that an assignment of water right application and permit no. 63-32573 to the City of Eagle was filed with IDWR on June 13, 2011.

The following protestants identified Bill Lawton as the spokesperson in the above contested case and during the hearing for the contested case: Robert L. Wood, M. Howard Goldman, and Timothy R. Milburn.

During prehearing procedures, some protestants were dismissed for failure to appear and participate. In a Default Order dated October 7, 2008, protestants Jonathan Seel, Jon Busack, Yvonne Morton, Cal Gothberg, and Brent Watson were dismissed as parties for failure to appear at the time and place set for prehearing conference.

In a Default Order dated May 14, 2009, protestants Bill Lawton, Robert L. Wood, M. Howard Goldman, and Timothy R. Milburn were dismissed as parties for failure to appear at the time and place set for hearing. The Default Order also informed the protestants Bill Lawton, Robert L. Wood, M. Howard Goldman, and Timothy R. Milburn that they could appear and testify as public witnesses.

The remaining active protestants were: David Head, John Thornton, or Ann Ritter as spokespersons for members of NACGUA, Alan Smith as spokesperson for Alan Smith and Eagle Pines Water Association, and Norman Edwards appearing individually.

Beginning in April 2009 and ending in July 2009, the interim director conducted a hearing regarding the protests. The following parties appeared at the hearing:

Jeffrey C. Fereday and Michael P. Lawrence, attorneys at law, appeared for M3 Eagle, John Thornton and David Head appeared on behalf of NACGUA and as spokespersons for multiple protestants, Alan Smith appeared on behalf of himself and Eagle Pines Water Association, and Norman L. Edwards represented himself.

Following the presentation of testimony, the parties submitted briefs and response briefs. The submittals were complete on October 4, 2009.

On December 21, 2009, the interim director issued a final order.

On January 4, 2010, Eagle Pines Water Association and NACGUA filed a petition for clarification and reconsideration. On January 4, 2010, M3 Eagle filed a petition for reconsideration and a motion to reopen the record. The Interim Director denied the relief requested in both petitions in the Amended Final Order issued on January 25, 2010.

The Amended Final Order held that M3 Eagle did not qualify as a municipal provider under I.C. § 42-202B and was not eligible to hold a water right permit for reasonably anticipated future needs ("RAFN"). The Amended Final Order further held that M3 Eagle should be issued a permit limited to 3.28 cfs, the amount of water that could be applied to beneficial use within the 5 year period for developing a standard, non-RAFN water right.

On February 19, 2010, M3 Eagle filed a petition for judicial review with the Fourth District Court in Ada County appealing the agency decision. Shortly after the Department filed the agency transcript and record with the Fourth District Court, M3 Eagle and the Department

filed a joint motion to suspend proceedings to provide time to discuss settlement alternatives that involved assignment of the water permit to the City of Eagle. M3 Eagle and the Department entered into a Settlement Agreement on January 19, 2011, which anticipated assignment of application for permit no. 63-32573 to the City of Eagle, a qualifying municipal provider. M3 Eagle assigned application for permit no. 63-32573 to the City of Eagle on June 13, 2011. On the same date, M3 Eagle and the Department entered into a Stipulation which provided for the dismissal of the judicial review case and remand back to the Department to accept additional evidence pertaining to the reasonably anticipated future water needs of the City of Eagle.

On June 30, 2011, the Fourth District Court issued an Amended Order dismissing the judicial review case and remanding the contested matter back with instructions for the Department to hold a remand hearing limited to taking evidence of population projections and planning data from the city and evidence of the annexation of the M3 Eagle development lands into the city.

The Department held the prehearing conference for the remand hearing on September 7, 2011 at the State Office in Boise. The Department held the remand hearing on October 18 and October 19, 2011 and the parties had the opportunity to introduce new evidence about the City of Eagle's reasonably anticipated future water needs and to cross-examine Department staff about its analysis of the city's future water needs. Protestants Eagle Pines Water Association, NACGUA, Alan Smith and Norman Edwards appeared at the remand hearing. Bruce Smith appeared on behalf of the applicant City of Eagle and Jeffrey Fereday and Michael Lawrence appeared on behalf of M3 Eagle at the remand hearing.

City of Eagle's Objection and Motion to Strike

The June 12, 2011 Stipulation anticipated that the city would provide certain types of planning information required to process a reasonably anticipated future needs ("RAFN") water right under Idaho law. The city supplied planning information prior to the remand hearing enabling the Department to evaluate the city's future need for water over the planning horizon. The city's population projection included a 4% growth rate and did not exclude the population served by the other water service providers in the city. Department staff reviewed the planning information and prepared a staff report evaluating the city's planning information. Although Department staff did not concur with the city's growth rate and the inclusion of the population served by the other water service providers in the city, Department staff concluded that the city had a future need for all of the 23.18 cfs of water sought under application 63-32573 over the planning horizon. The staff report was introduced into evidence during the remand proceeding and was marked as Exhibit R100.

At the remand hearing on October 18, 2011, the city introduced into evidence a revised *Reasonably Anticipated Future Needs Water Right Analysis* ("*Revised RAFN Water Right Analysis*") supporting a greater future need for water than what had been previously submitted by the city and reviewed by the Department. The Prehearing Order dated September 8, 2011 required that the parties exchange all exhibits and expert reports intended to be offered into evidence and relied upon at the hearing by October 14, 2011. Because the city's revised materials were not submitted until the day of the remand hearing, thus eliminating any prior

Department staff review, the Director declines to consider the *Revised RAFN Water Right Analysis.*

On October 19, 2011, at the end of the remand hearing, the city filed a motion to strike parts of the Department's staff report. *Objection and Motion to Strike June 1, 2011 Revised October 4, 2011 RAFN as Amended October 17, 2011 Evaluation for the City of Eagle in Connection with the Application for Permit 63-32573* ("Motion to Strike"). The city subsequently filed a *Closing Statement of the City of Eagle* on November 23, 2011, which reiterated the arguments made in the Motion to Strike.

The Hearing Officer has reviewed the city's arguments and finds that the Motion to Strike should be denied.

The city raises a number of arguments in its Motion to Strike and in its closing argument. The consistent theme advanced by the city's arguments is that the Department is required to defer to and unconditionally accept the city's determinations regarding population projections and planning data. The city challenges the authority of the Department to critically review its RAFN application and determine any result other than what the city submits. The city maintains that the Department does not possess the authority under I.C. § 42-202B to consider any information or make any finding that is different from the city's conclusions and to do so would be arbitrary, irreparably flawed and contrary to the Local Land Use Planning Act I.C. § 67-6502 et seq.

Although the Director disagrees with the city's interpretation and believes the Department does possesses the authority under I.C. § 42-202B to review and to independently determine the reasonableness of RAFN information submitted by a city, he declines to address those arguments in this proceeding. Because the earlier planning information submitted by the city was sufficient for the Department to conclude that the city has a future need for all the water under application 63-32573 over its planning horizon, there is no need to evaluate the revised planning information or address the city's arguments. The Motion to Strike should be denied as the Department staff evaluation concludes that the city has demonstrated a need under I.C. § 42-202B for all the water applied for under the present application before the Department. Whether the Department staff evaluation or the city's evaluation is used does not matter in the end because the conclusion is the same: the city needs the maximum amount of water available under this permit. The city is not entitled to any additional relief to establish RAFN water rights in future yet unfiled water right applications. The city will have an opportunity to submit its revised planning information and resurrect any legal argument made herein or make additional arguments if necessary in a subsequent proceeding should it file for an additional water right in the future.

FINDINGS OF FACT

1. Application to appropriate water no. 63-32573, originally filed by M3 Eagle and subsequently assigned to the City of Eagle, proposes the following:

Flow Rate:	23.18 cubic feet per second ("cfs") 2.93 cfs diversion to municipal storage 1,836 acre-feet stored in ponds on the proposed development. 1,660 acre-feet diversion from storage
Source of Water:	Ground water
Period of Use:	Year-round
Priority Date:	November 21, 2006
Place of Use:	Municipal within the boundaries of the M3 Eagle development
Volume:	6,535 acre-feet
Points of Diversion:	
Township 5 North, Range 1 West, Section 13,	SENW
Section 15 (Potential Municipal)	SWSW
Section 21 (Potential Municipal)	SESE
Section 22 (Potential Municipal)	NENE, NESE
Section 23	NESW, SESW
Section 23 (Potential Municipal)	SWNE, NENW, NESW, SESW, NESE
Section 24	NWNE, NENW
Section 24 (Potential Municipal)	NESW
Section 27 (Potential Municipal)	NENE, SENW
Section 28	SWSE, SESE(2)
Section 28 (Potential Municipal)	SWNE, SESE
Section 33	NENE, NWNE(2)
Section 33 (Potential Municipal)	NWNE
Township 5 North, Range 1 East, Section 19	SWNE

2. At the time the original hearing record was closed, the M3 Eagle lands had not been annexed and therefore were not a part of city. Those lands were subsequently annexed into the city under Ordinance 634 on November 30, 2009. Evidence of the annexation was introduced into the record at the remand hearing.

3. The development is proposed for approximately 6,000 acres of real estate located approximately five to ten miles northwest of the city center of Eagle, Idaho. The M3 Eagle property is located within the City of Eagle in the foothills of northwest Ada County. The parcel of property is approximately seven miles long in an east – west direction and approximately four miles wide in a north – south direction. Portions of the drainages of Big Gulch and Little Gulch are within the proposed M3 Eagle development. The parcel is bounded by Willow Creek Road on the east, Highway 16 on the west, BLM property on the south, and additional undeveloped land to the north.

4. The property is presently raw land and has been used in the past for dry grazing. There is no concentrated residential development on the property. The property lies within the City of Eagle water service area although there is no municipal system currently providing municipal water to any users within the property boundaries.

5. The BLM property located south of the M3 Eagle property is an approximate one mile wide buffer zone between the M3 Eagle property and scattered residential/ranchette development and agricultural lands at the base of the foothills as they transition south into the Boise River Valley. Any water lines from the City of Eagle and its integrated system are located several miles from the proposed development.

6. On December 27, 2007, M3 Eagle and the City of Eagle executed a Preannexation and Development Agreement. The agreement contemplated that the water system within the M3 Eagle development will be constructed at the developer's expense, conveyed to the City of Eagle, and become part of the city's municipal water system. M3 Eagle assigned permit no. 63-32573 to the city on June 13, 2011 and has continued to participate in this matter as an interested party.

7. The place of use will be developed as a planned unit development/planned community with homes, schools, and a commercial district within the development. Presently, 7,153 dwelling units are planned for the community. At build-out, M3 Eagle projects a population within the development of approximately 21,000 people. In addition, M3 Eagle plans to develop 245 acres of commercial, office, and mixed use.

8. Within the development, M3 Eagle projects the construction of three elementary schools, one middle school, and one high school. In addition there will be one or more golf courses.

9. Approximately twenty to forty percent of the development will be open space.

10. The city annexed the proposed place of use for permit no. 63-32573 by ordinance 634 dated November 30, 2009. The city's service area as described in its Water Service Planning Area map corresponds to its corporate limits. The water service planning area for the city is consistent with the updated comprehensive land use plan.

11. The city proposed a 30 year planning horizon which is consistent with the timeframes used by other planning entities in Idaho and is a reasonable length of time for a municipality to hold water rights to satisfy its reasonably anticipated future water needs.

12. The projected water demand calculations submitted by the city are reasonable. The city's methodology used to establish a proposed demand per household with a 1.7 peaking factor is consistent with water usage calculations for other similar urban areas.

13. The population projections submitted by the city are reasonable and establish that there will be enough people within the City of Eagle's service area to use the entire amount of water applied for under permit no. 63-32573 within the 30 year planning horizon.

14. The Director finds that the population projections for the M3 Eagle proposed planned unit development over the 30 year planning horizon are reasonable.

15. The jobs data on pages 2 through 5 of Exhibit R-8, submitted by M3 Eagle, is too short in duration to be helpful by itself. For instance, the vertical axis for the graphs is titled "Annual Percent Change" for employment numbers in Idaho. The direction of job growth, or "annual percent change" only recently switched from negative to positive sometime in 2011. In two of the graphs, the direction of the line drawn between the most recently plotted points was either negative or flat.

16. However, other updated economic and population forecast reports are helpful. They show that Idaho is still expected to grow, albeit at a slower, more modest rate than before the economic downturn. Idaho's population is expected to increase at a rate faster than the state's natural rate of population growth, indicating an ongoing net in-migration of population into Idaho. Ex. R-8, at 6. The population and household forecast compiled by the Community Planning Association of Southwest Idaho (COMPASS) predicts modest growth. The COMPASS March 2011 Community Choices forecast, predicts a slower growth rate than experienced in recent years, but still predicts that population in Ada and Canyon Counties will surpass 1.05 million with 388.4 thousand households by 2035. *Id.* at 7. This computes to an annual average population growth of 2.4 percent per year in Ada and Canyon Counties over the 2010-2035 period. Although the planning horizon extends through the year 2040, the COMPASS forecast is still helpful to show that the expected future growth trend is positive. COMPASS's 2.4 percent predicted growth rate is a region-wide average; some areas will grow faster than 2.4 percent, others will grow more slowly.

17. The M3 development has a greater opportunity for growth because it is a planned unit community and can offer a wider range of products and amenities than a smaller development within the city limits. Ex. R-8 at 9. The proposed development is located in an area of expected higher growth (west Ada County) and will also have access to increased transportation opportunities. *Id.* at 9-15.

18. Despite the large number of proposed points of diversion identified in the application, the total number of points of diversion estimated by M3 Eagle will probably be between five and seven wells. M3 Eagle applied for a larger number of proposed points of diversion to allow flexibility in location and to allow additional wells to be drilled depending on the productivity of wells as they are completed.

19. Testimony at the hearing established that state of the art conservation measures will be employed through system design, monitoring, and reuse of waste water for ponds and irrigation. M3 Eagle plans to install an independent waste water treatment facility and will treat the water to drinking water quality standards.

20. The proposed points of diversion for the M3 Eagle development are located in an area of complex hydrogeology. Significant testing and analysis by M3 Eagle established that the

water underlying the M3 Eagle property is located in a sand aquifer characterized by M3 Eagle as the Pierce Gulch Sand Aquifer ("PGSA").

21. The PGSA is the target aquifer proposed to supply the water sought in the M3 Eagle Application. The PGSA lies beneath the southwestern portion of the M3 Eagle planned community property and has been identified in municipal wells in Eagle, Garden City, Meridian, Star, and the foothills north of Eagle. Ex. 12 at ii and Ex. 45 at 27. The PGSA comprises a 150- to 360 foot thick sequence of stratified sand layers with interbedded thin and locally discontinuous layers of silt and clay. Ex. 2 at 3 and Ex. 44 at 4.

22. The PGSA is overlain by a sequence of fine to coarse-grained alluvial sediments. M3 Eagle's expert witnesses referred to these sediments as the unnamed shallow alluvial aquifer. Ex. 44 at 7.

23. Beneath the southern portion of the M3 Eagle property, a sequence of lower-permeability sediments consisting mostly of clay and silt separates the unnamed shallow alluvial aquifer from the PGSA andconfines the PGSA below the unnamed shallow alluvial aquifer. Ex. 44 at 7 and Ex. 16 at 16. Elsewhere, available geologic and geophysical data do not establish a distinct separation between the unnamed shallow alluvial aquifer and the PGSA at some locations. Ex. 45 at 6. Hydraulic communication between the unnamed shallow alluvial aquifer and the PGSA is spatially variable because the presence and thickness of the confining layer is spatially variable. Ex. 50 at 4.

24. The majority of the more than 1,600 domestic wells in the vicinity of the M3 Eagle project area are completed in the unnamed shallow alluvial aquifer that overlies the PGSA. Ex. 2 at 10 and Figure 11, Ex. 12 at 239, and Ex. 33D at 24.

25. The hydrogeologic setting is relatively complex (Ex. 19E at 6, Ex. 19H at 23, and Ex. 19D at 71) and the PGSA is heterogeneous. Ex. 12 at 210-211.

26. The hydrologic impact of faults at the northern margin of the Boise basin near M3 Eagle contributes to hydrogeologic complexity. Ex. 33G at 2, Ex. 67 at 32, Ex. 44 at 42, Ex. 33D at 16, and Ex. 12 at 212.

27. Wells 03N01E01DAA2 (east of Meridian), 04N01E04DCC1 (north of Eagle), 04N01W31AA1 (south of Star), all in the PGSA, were identified in the TVHP as having long-term water level declines of less than 10 feet. Ex. 33D at 50, 133, 136. Well 04N01E35CCA1 (west of Garden City) in the unnamed shallow alluvial aquifer was identified in the TVHP as having long-term water level declines of less than 10 feet. Ex. 33D at 50, 133.

28. Although the monitoring records for M3 Eagle Test Well #2, M3 Eagle Test Well #3, M3 Eagle Test Well #4 and SVR Well #9 are brief, the hydrographs for these 4 wells located in the PGSA show a declining water level trend of approximately 0.3 to 0.6 feet per year. Ex. 44 at 128.

29. Water levels in 14 wells in North Ada County completed in different hydrostratigraphic units that comprise the PGSA and unnamed shallow alluvial aquifer that are

monitored by the Department have been declining at an average rate of 0.27 feet per year since 1996. Ex. 906 at 4.

30. The hydrograph for the United Water Idaho Redwood Creek production well (SE ¼ of the NW ¼ of Section 7 in Township 04N Range 01E) which is completed into the PGSA in west Eagle depicts fairly constant water levels throughout the 14-year period of production. This well has historically produced 10 million to 100 million gallons per year. Figure 15 of Ex. 45.

31. The hydrograph for the United Water Idaho Floating Feather production well which is completed into the PGSA in northwest Eagle (SE ¼ of the SW ¼ of Section 5 in Township 04N Range 01E) has remained constant throughout the 13-year period of production. This well has historically produced 250 million to 650 million gallons per year. Figure 15 of Ex. 45.

32. Hydrographs for the United Water Idaho State and Linder monitoring wells which are completed into the PGSA (NE ¼ of the SE ¼ of Section 11 in Township 04N Range 01W) depict relatively stable water levels in the PGSA between Star and Eagle over the past 10 years. Ex. 28.

33. Aquifer testing and water supply well production data demonstrate that the PGSA is highly productive. For example, the SVR#7 test well on the M3 property was pumped at a constant rate of approximately 900 gal/min for approximately 9 days. Moreover, the SVR#7 test data support the determination that a properly designed well could produce more than 2,000 gal/min from the PGSA on M3 Eagle property. Ex. 44 at i. Elsewhere, the PGSA yields more than 1,000 gal/min to municipal supply wells (e.g., the City of Eagle Eaglefield #2 and United Water of Idaho Floating Feather supply wells). Ex. 12 at Table i-1.

34. The volume limit sought by the M3 Eagle application (6,542 acre-ft/yr equating to an average constant diversion rate of 9.03 cfs) represents a roughly 6% increase in the estimated rate of withdrawal in 1996 from the intermediate and deep aquifer systems described in the Treasure Valley Hydrologic Project (TVHP) ground water flow model as layers 2, 3, and 4. Ex. 33B at 68.

35. The completion intervals for existing municipal wells in the Eagle area correspond to the bottom of layer 2 and the top of layer 3 in the 4-layer TVHP model. *See* Ex. 33B at 16-19 for discussion of TVHP model layers. Data provided by M3 Eagle suggests that M3 Eagle also proposes production from layers 2 and 3.

36. The 1996 water budget developed for the TVHP model concluded that more than 99% of the more than 1 million acre-feet of inflow to the Treasure Valley Aquifer system was received by the uppermost aquifer (layer 1). Ex. 33l at 6-2 Table 8 and Ex. 33B at 56. Of that amount, the TVHP model estimated approximately 77% of the water received by the uppermost aquifer was discharged through surface water features, 9% was pumped from the uppermost aquifer, and 10% was pumped from deeper aquifers represented in the model by layers 2, 3, and 4. Ex. 33B at 68.

37. The TVHP study concluded that recharge to the deeper, regional aquifer system in the Treasure Valley is limited, but generally has been sufficient for current rates of withdrawal. Ex. 33A at 19.

38. Nonetheless, a 6% increase in the total withdrawal from the PGSA is not insignificant. Diversion of 23.18 cfs of water could stress the aquifer. The Director shouldexercise caution when allocating a significant quantity of water for an extended development into the future. As a result, the Director will require an extensive ground water monitoring program as discussed in Finding of Fact 53 below.

39. The TVHP model was applied to evaluate the impacts of increased groundwater withdrawals associated with unprocessed applications for non-supplemental water rights that were filed between July 1987 and May 2002. Ex. 33C at 1. A predictive analysis was conducted in which the increase in withdrawals by these proposed rights was simulated with several, well-calibrated (i.e. calibrated to water level data), and equally valid versions of the TVHP model. The "minimum impact" was the well-calibrated version of the model that predicted the least water level impacts. The "maximum impact" was the well-calibrated version of the model that predicted the greatest water level impacts. The following are based upon the predictive simulations in Ex. 33C:

a. Layer 1 (shallow aquifer) The simulated pumping, which included a 29,292 acre-ft/yr (40.4 cfs) increase in withdrawals from layer 1, resulted in an average ground water decline in layer 1 at steady state from 0 feet for the minimum impact calibration to 3.9 feet for the maximum impact calibration.

b. Layer 2 (intermediate aquifer) The simulated pumping, which included a 6,712 acre-ft/yr (9.3 cfs) increase in withdrawals from layer 2, resulted in an average ground water decline in layer 2 at steady state from 14 feet for the minimum impact calibration to 26 feet for the maximum impact calibration.

c. Layer 3 (deep aquifer) The simulated pumping, which included a 2,371 acre-ft/yr (3.3 cfs) increase in withdrawals from layer 3, resulted in an average ground water decline in layer 3 at steady state ranging from 18 feet for the minimum impact calibration to 46 feet for the maximum impact calibration.

40. The range of average predicted water level declines that resulted from the TVHP model predictive analysis is a reflection of model input uncertainty. Ex. 33C at 31.

41. The TVHP model's predicted impacts of increased pumping were smallest in the uppermost model layer, which corresponds roughly with the uppermost 200 feet of aquifer system. The TVHP study concluded that most of the simulated withdrawals represented water that otherwise would have discharged to drains. Ex. 33A at 22.

42. The TVHP model's predictive analysis concludes that, due in large part to the hydrologic functioning of drains, increased pumping from the shallow and deep aquifers is expected to have limited impact on water levels in the uppermost aquifer system (layer 1) at a regional scale. Ex. 33C at 34.

43. Notwithstanding the TVHP model's predicted limited impact, water levels and rates of extraction in the PGSA should be monitored to evaluate possible localized impacts and to monitor the actual effect of pumping, if any, on water levels in the uppermost aquifer in the North Ada County area.

44. M3 Eagle constructed a numerical ground water model ("M3 Model") to simulate the effects of withdrawals from the M3 Eagle development at full build-out. The area within the model, defined as the model domain, encompasses 520 square miles. Ex. 16 at 16.

45. Concerns about the calibration of the M3 Model and inconsistencies with the conceptual model cause the Department to question the outputs of the model. Ex. 47 at 10, 13. Ex.50 at 13, 14. Ex. 902 at 58, 60-65, 69, 87 and 92. Ex. 904 at 33-34. The Director does not rely upon the conclusions of the M3 Model's simulations.

46. Although the Director does not rely on the M3 Model, the other aquifer test, geologic data, and water level measurement information provided by M3 Eagle in the record supports a determination that the PGSA is productive, extensive, and has additional water available for appropriation.

47. An image well analysis is a standard methodology used by hydrologists to determine impacts from pumping on water levels. M3 Eagle's consultants conducted an image well analysis to predict water level declines that would result from ground water development in the PGSA at full build out for both "best-case" and "worst-case" conditions. Ex 2. at 8. The predicted water level declines in the PGSA in that analysis are on the order of 10 to 12 feet along the boundary of the M3 Eagle property for the best-case and 20 to 24 feet for the worst-case conditions. Ex. 2 at Figures 9 and 10.

48. Department staff conducted their own independent drawdown analysis. Based on their analysis, Department staff concluded that the results of the M3 Eagle analyses were reasonable assuming a laterally extensive aquifer. Ex. 50 at 21. The Department's drawdown estimates were most similar to those for M3 Eagle's "worst-case" image well analysis conditions. Ex. 2 at Figure 10. Both simulations predicted approximately 8 feet of drawdown in the PGSA at the intersection of Floating Feather and Highway 16, a location chosen because it is easily identifiable and situated several miles south of the M3 Eagle pumping center.

49. Almost every appropriation of ground water will result in a decline of the aquifer from which water is being pumped. Some decline in the aquifer is expected and reasonable. Based upon the evidence presented in this proceeding, the Director concludes that even under the worst-case conditions described in M3 Eagle's image well analysis, the anticipated decline from pumping at full build out is unlikely to have a negative impact to other wells located in the PGSA and is not cause to conclude that there is not water available in the amount required for the appropriation.

50. The TVHP model suggests that water level declines in the wells located in the unnamed shallow alluvial aquifer (where most of the Protestants' wells are located) are expected to be much less than the drawdown in the PGSA. Because of this, and because drawdown decreases with the increasing distance from the M3 Eagle pumping center, it is unlikely that

pumping by M3 in the PGSA will have a negative impact on water levels in the unnamed shallow alluvial aquifer.

51. Although the pumping rate of water from proposed M3 Eagle wells will vary because of seasonal irrigation demand, the available water in the PGSA is sufficient for the purpose it was sought to be appropriated in the M3 Eagle application.

52. The PGSA contains water available for appropriation for the following reasons: (1) water levels in the M3 Eagle wells and the other nearby wells pumping water from the PGSA are relatively stable; (2) the conclusion of the TVHP that there has been sufficient ground water in the deeper aquifers for current rates of withdrawal of water; (3) the aquifer testing provided by M3 Eagle and testimony establish that the PGSA is productive; and (4) M3 Eagle's image well analysis and the Department's image well analysis confirm that the expected drawdown is not significant.

53. The Director recognizes that even despite existing information and analysis, there is a possibility that the diversion of water may negatively impact other water users. Consequently, the Director will require M3 Eagle and the city to comply with an extensive ground water monitoring program. Department staff approved the monitoring plan dated March 17, 2011 submitted by M3 Eagle. The purpose of the monitoring plan is to track ground water withdrawals from the M3 Eagle development and report the findings to the Department annually. The monitoring plan requires the applicant continuously monitor six wells and submit the data on a semi-annual basis. An interpretative report on production and drawdown will be filed annually.

54. The Development Agreement between M3 Eagle and the city requires M3 Eagle to pay for the costs of the planned unit development, including construction of the water system. M3 Eagle owns the property planned for development without encumbrances. M3 Eagle is able to take advantage of the Community Infrastructure District Act, Idaho Code § 50-3101 *et seq.*, for infrastructure development and can sell tax exempt bonds for financing. Expert witnesses testified that the possibility of obtaining such financing is good.

CONCLUSIONS OF LAW

1. Idaho Code § 42-203A(5) states in pertinent part:

> In all applications whether protested or not protested, where the proposed use is such (a) that it will reduce the quantity of water under existing water rights, or (b) that the water supply itself is insufficient for the purpose for which it is sought to be appropriated, or (c) where it appears to the satisfaction of the director that such application is not made in good faith, is made for delay or speculative purposes, or (d) that the applicant has not sufficient financial resources with which to complete the work involved therein, or (e) that it will conflict with the local public interest as defined in section 42-202B, Idaho Code, or (f) that it is contrary to conservation of water resources within the state of Idaho, or (g) that it will adversely affect the local economy of the watershed or local area within which the source of water for the proposed use originates, in the case where the place of use

is outside of the watershed or local area where the source of water originates; the director of the department of water resources may reject such application and refuse issuance of a permit therefore, or may partially approve and grant a permit for a smaller quantity of water than applied for, or may grant a permit upon conditions.

2. The applicant bears the ultimate burden of proof regarding all the factors set forth in Idaho Code § 42-203A.

3. Idaho Code § 42-202B(5) defines the term municipal provider:

> (5) "Municipal Provider" means:
> (a) A municipality that provides water for municipal purposes to its residents and other users within its service area;
> (b) Any corporation or association holding a franchise to supply water for municipal purposes, or a political subdivision of the state of Idaho authorized to supply water for municipal purposes, and which does supply water, for municipal purposes to users within its service area; or
> (c) A corporation or association which supplies water for municipal purposes through a water system regulated by the state of Idaho as a "public water supply" as described in section 39-103(12), Idaho Code.

4. Idaho Code § 42-202B(6) defines how a water right can be used for municipal purposes:

> (6) "Municipal purposes" refers to water for residential, commercial, industrial, irrigation of parks and open space, and related purposes, excluding use of water from geothermal sources for heating, which a municipal provider is entitled or obligated to supply to all those users within a service area, including those located outside the boundaries of a municipality served by a municipal provider.

5. The City of Eagle is a municipal corporation under Idaho Code § 50-102 that provides water for municipal purposes to its residents within its service area and meets the qualification as a municipal provider under Idaho Code § 42-202B(5).

6. Idaho Code § 42-202(2) states:

> (2) An application proposing an appropriation of water by a municipal provider for reasonably anticipated future needs shall be accompanied by sufficient information and documentation to establish that the applicant qualifies as a municipal provider and that the reasonably anticipated future needs, the service area and the planning horizon are consistent with the definitions and requirements specified in this chapter. The service area need not be described by legal description nor by description of every intended use in detail, but the area must be described with sufficient

information to identify the general location where the water under the water right is to be used and the types and quantity of uses that generally will be made.

7. Idaho Code § 42-202B(7) defines the term planning horizon:

> (7) "Planning horizon" refers to the length of time that the department determines is reasonable for a municipal provider to hold water rights to meet reasonably anticipated future needs. The length of the planning horizon may vary according to the needs of the particular municipal provider.

8. Idaho Code § 42-202B(8) defines the term reasonably anticipated future needs:

> (8) "Reasonably anticipated future needs" refers to future uses of water by a municipal provider for municipal purposes within a service area which, on the basis of population and other planning data, are reasonably expected to be required within the planning horizon of each municipality within the service area not inconsistent with comprehensive land use plans approved by each municipality.

9. Idaho Code § 42-202B(9) defines the term service area:

> (9) "Service Area" means that area within which a municipal provider is or becomes entitled or obligated to provide water for municipal purposes. For a municipality, the service area shall correspond to its corporate limits, or other recognized boundaries, including changes therein after the permit or license is issued. The service area for a municipality may also include areas outside its corporate limits, or other recognized boundaries, that are within the municipality's established planning area if the constructed delivery system for the area shares a common water distribution system with lands located within the corporate limits. For a municipal provider that is not a municipality, the service area shall correspond to the area that it is authorized or obligated to serve, including changes therein after the permit or license is issued.

10. The City of Eagle qualifies as a municipal provider and has submitted evidence of a reasonable future need over a reasonable planning horizon for its service area that is not inconsistent with the city's comprehensive land use plan.

11. It is in the public interest to grant a water right to the city for 23.18 cfs for anticipated future needs from the PGSA over its 30 year planning horizon to provide for the orderly expansion of the city's existing municipal water systems to serve the M3 Eagle planned development.

12. Based on the evidence submitted, the City of Eagle should be granted a permit for 23.18 cfs for its reasonably anticipated future needs to serve the M3 Eagle planned development over the next 30 years subject to conditions to protect existing senior water users.

13. Based on evidence available to the Director at this time, the water supply is sufficient to provide an appropriation of 23.18 cfs.

14. Based on evidence available to the Director at this time, an appropriation of 23.18 cfs with an annual volume limitation of 6,535 acre-feet from the PGSA will not injure other water rights. The Department should include a condition of approval in the permit that requires the permitee to operate an approved monitoring plan to determine if ground water pumping is causing material injury to senior water rights.

15. Consistent with Idaho Code § 42-204, the Director should include a condition of approval requiring proof to be submitted within 5 years. However, because the approval is for a reasonably anticipated future needs water permit over a 30 year planning horizon, it will be difficult to evaluate the extent of beneficial use for licensing purposes after only 5 years. Requiring the permit holder to exercise the option to extend the time in which to submit proof of beneficial use will allow the Director to lengthen the time for the Department's review of the water development. The Director should include a condition of approval that requires the filing of an application for extension of time for filing proof of beneficial use.

16. The city shall ensure that the developer employ measures of conservation consistent with those measures identified in the M3 Eagle Master Potable Water & Wastewater Study to conserve the waters of the state of Idaho. An appropriation of 23.18 cfs is in the public interest.

17. The application is made in good faith, and the application is not filed in bad faith or for speculative purposes.

18. M3 Eagle has demonstrated sufficient financial resources to develop the planned unit development.

ORDER

Based upon a review of the record and pleadings of the parties relating to this issue and consistent with the forgoing discussion and analysis,

IT IS HEREBY ORDERED that the City of Eagle's motion to strike is **DENIED**.

IT IS FURTHER ORDERED that application to appropriate water no. 63-32573 is **APPROVED** for the appropriation of the following quantities:

Flow rate:	23.18 cfs
Flow rate diverted to storage:	2.93 cfs
Total flow rate:	23.18 cfs

Annual volume diverted:	6,535	acre-feet
Annual volume diverted from storage:	1,660	acre-feet
Volume of storage:	1,836	acre-feet
Total annual volume authorized	6,535	acre-feet

IT IS FURTHER ORDERED that a map depicting the place of use boundary for this water right at the time of this approval will be attached to the permit approval document for illustration purposes.

IT IS FURTHER ORDERED that permit no. 63-32573 is subject to the following conditions:

This right authorizes a peak diversion rate of 23.18 cfs with an annual diversion volume limit of 6,535 acre-feet of water for reasonably anticipated future needs for a 30 year planning horizon within the service area pursuant to Chapter 2, Title 42, Idaho Code.

The full system capacity necessary to provide water for the reasonably anticipated future needs authorized under this right must be constructed by the end of the designated planning horizon.

I.C. § 42-204 requires that project construction commence within one year from the date of permit issuance and shall proceed diligently to completion unless it can be shown to the satisfaction of the Director of the Department of Water Resources that delays were due to circumstances over which the permit holder had no control. Water right holder has improved, developed, and installed a pump, electrical wiring and transformer, and a measuring tube in the SVR7 well (located at NE¼SW¼, Section 23, Township 5 North, Range 1 West), and has improved, developed, and installed well casing in the Kling Irrigation well (located at SE¼SE¼, Section 28, Township 5 North, Range 1 West). Both of these wells are authorized points of diversion for this permit. Accordingly, the requirement concerning commencement of construction has been met.

Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code and applicable Well Construction Rules of the Department.

The place of use is generally located within Sections 7, 15, 17, 18, 19, 20, 21, 22, Township 5 North, Range 1 East, and Sections 10, 11, 12, 13, 14, 15, 21, 23, 24, 26, 27, 28, and 33, Township 5 North, Range 1 West.

The right holder shall not provide water diverted under this right for the irrigation of land having appurtenant surface water rights as a primary source of irrigation water except when the surface water rights are not available for use. This condition applies to all land with appurtenant surface water rights, including land converted from irrigated agricultural use to other land uses but still requiring water to irrigate lawns and landscaping.

A proof of beneficial use statement shall be due on or before March 9, 2017. If proof is submitted on or before March 9, 2017, the permit holder shall, at the same time, submit a request for a five year extension of time pursuant to Idaho Code § 42-204(5). Based upon the

information provided, the Director will decide whether it is appropriate to grant the extension. Nothing in this condition prevents the permit holder from submitting a request for extension of time to submit proof of beneficial use prior to the filing of proof.

In connection with the proof statement submitted for this permit, the permit holder shall submit a report showing the total annual volume, the maximum daily volume, and the maximum instantaneous rate of flow diverted from the points of diversion authorized for this permit during the authorized development period for the permit. For development both inside and outside of the M3 Eagle development boundaries, the report shall also show the extent to which the full system capacity necessary to provide water for reasonably anticipated future needs has been constructed and the extent to which planning, design, and investment have occurred for any unconstructed portion of the system capacity necessary to divert and use water for reasonably anticipated future needs. The Department will evaluate such proof statement and report consistent with IDWR Application Processing Memorandum No. 63 (June 15, 1999) unless legally obligated to do otherwise.

In accordance with Idaho Code § 42-217, in connection with proof of beneficial use for this permit, the right holder shall also submit a revised estimate of the reasonably anticipated future needs, a revised description of the service area, and a revised planning horizon, together with appropriate supporting documentation.

The right holder shall comply with all aspects of the approved Monitoring Plan dated March 17, 2011. A copy of the monitoring plan is attached hereto as Attachment A and incorporated herein by this reference.

This right does not grant any right-of-way or easement across the land of another.

The Director retains jurisdiction to require the right holder to provide purchased or leased natural flow or stored water to offset depletion of Lower Snake River flows if needed for salmon migration purposes. The amount of water required to be released into the Snake River or a tributary, if needed for this purpose, will be determined by the Director based upon the reduction in flow caused by the use of water pursuant to this permit.

If, during the established planning horizon, the Department determines, based on credible evidence from the monitoring, the monitoring report or otherwise, that there is a substantial likelihood that diversion and use of groundwater under the permit is causing material injury to any senior water rights, the Department may issue an order to the water right holder to show cause, after notice and hearing, as to why the water right holder should not reduce existing diversions under the permit, forego additional diversions, or provide adequate mitigation to remedy any such material injury. Any senior water user alleging material injury may petition the Department to commence a show cause hearing and the Department shall conduct a hearing. Any such hearing shall be held according to the Department's rules governing contested cases and its conjunctive management rules and a final decision shall be made on the record according to the evidence. Nothing in this paragraph shall create any evidentiary presumption, establish or change any burden of proof or obligation to come forward with evidence, or otherwise modify the rights of any water right holder under Idaho law.

In exercising its continuing authority under this Order, the Department shall take into consideration all monitoring data, hydrogeologic evidence, and other information pertaining to the question whether water right holder's ground water pumping under this permit is causing material injury to any of protestants' senior water rights.

In accordance with Idaho Code § 42-226, Idaho Code §§ 42-237a through 237h, and Idaho Code § 42-607, and the Department's Rules, IDAPA 37.03.011 (as these may be amended from time to time), water diversion and use under this permit shall be subject to curtailment when and to the extent the Department determines such diversion and use is causing material injury to senior water rights and is not mitigated.

DATED this 9th day of March, 2012.

GARY SPACKMAN
Interim Director

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 9th day of March, 2012, a true and correct copy of the documents described below were served on the following by hand delivering or by placing a copy of the same in the United States mail, postage prepaid and properly addressed to the following:

Document(s) Served: SECOND AMENDED FINAL ORDER and Explanatory Information to Accompany a Final Order

Name	Address	City	State	Postal Code
BRUCE SMITH MOORE SMITH BUXTON & TURCKE, CHTD.	950 W. BANNOCK, STE. 520	BOISE	ID	83702
CITY OF EAGLE	660 E CIVIC LANE	EAGLE	ID	83616
JEFFREY C FEREDAY GIVENS PURSLEY LLP	601 W BANNOCK ST PO BOX 2720	BOISE	ID	83701
M3 EAGLE LLC	533 E RIVERSIDE DR STE 110	EAGLE	ID	83616
ALAN SMITH	3135 OSPREY RD	EAGLE	ID	83616
EAGLE PINES WATER USERS ASSN	3135 N OSPREY RD	EAGLE	ID	83616
JOHN THORNTON	5264 N SKY HIGH LN	EAGLE	ID	83616
NORTH ADA COUNTY FOOTHILLS ASSN ATTN: DAVID HEAD	855 STILLWELL DR	EAGLE	ID	83616
NORMAN L EDWARDS	884 W BEACON LIGHT RD	EAGLE	ID	83616
LINDA D BURKE	C/O 855 STILLWELL DR	EAGLE	ID	83616
JOHN FRANDEN	C/O 855 STILLWELL DR	EAGLE	ID	83616
CRAIG TARBET	C/O 855 STILLWELL DR	EAGLE	ID	83616
SHERRI RANDALL	C/O 855 STILLWELL DR	EAGLE	ID	83616
CHARLES WATKINS	C/O 855 STILLWELL DR	EAGLE	ID	83616
ROBERT H WEST	C/O 855 STILLWELL DR	EAGLE	ID	83616
STEPHEN DICK	C/O 855 STILLWELL DR	EAGLE	ID	83616
BRUCE VAN CAMP	C/O 855 STILLWELL DR	EAGLE	ID	83616
LORING EVANS	C/O 855 STILLWELL DR	EAGLE	ID	83616
THOMAS RITTER	C/O 855 STILLWELL DR	EAGLE	ID	83616
LORN H ADKINS	C/O 855 STILLWELL DR	EAGLE	ID	83616
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RICHARD LAGERSTROM	C/O 855 STILLWELL DR	EAGLE	ID	83616
VINCE IAZZETTA	C/O 855 STILLWELL DR	EAGLE	ID	83616

Name	Address	City	State	Postal Code
DALE GASTON	C/O 855 STILLWELL DR	EAGLE	ID	83616
MARION D GROOTHUIS	C/O 855 STILLWELL DR	EAGLE	ID	83616
VINCENT J MINKIEWICZ	C/O 855 STILLWELL DR	EAGLE	ID	83616
CAROL JEAN THOMPSON	C/O 855 STILLWELL DR	EAGLE	ID	83616
BARB JEKEL	C/O 855 STILLWELL DR	EAGLE	ID	83616
ROBERT LYONS	C/O 855 STILLWELL DR	EAGLE	ID	83616
G E MC DONALD	C/O 855 STILLWELL DR	EAGLE	ID	83616
GEORGE W KEYES	C/O 855 STILLWELL DR	EAGLE	ID	83616
ERIC C LEIGH	C/O 855 STILLWELL DR	EAGLE	ID	83616
SHELBY CONRAD	C/O 855 STILLWELL DR	EAGLE	ID	83616
MORGAN MASNER	C/O 855 STILLWELL DR	EAGLE	ID	83616
JIM BANDUCCI JR	C/O 855 STILLWELL DR	EAGLE	ID	83616
STEVEN C PURVIS	C/O 855 STILLWELL DR	EAGLE	ID	83616
ROBERT S NICCOLLS JR	C/O 855 STILLWELL DR	EAGLE	ID	83616
DAVID COLLETT	C/O 855 STILLWELL DR	EAGLE	ID	83616
WALTER H MEYER JR	C/O 855 STILLWELL DR	EAGLE	ID	83616
MICHAEL MC MURRAY	C/O 855 STILLWELL DR	EAGLE	ID	83616
LYLE JORDAN	C/O 855 STILLWELL DR	EAGLE	ID	83616
RONALD R RAPP	C/O 855 STILLWELL DR	EAGLE	ID	83616
BRUCE RICHARDSON	C/O 855 STILLWELL DR	EAGLE	ID	83616
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Emalee Rushing

Emalee Rushing
Administrative Assistant
Idaho Department of Water Resources

Hydro Logic, Inc.
1002 W. Franklin Street, Boise, ID 83702 (208) 342-8369, Fax (208) 342-3100, hli@hydrologicinc.net

RECEIVED
MAR 18 2011
DEPARTMENT OF
WATER RESOURCES

TECHNICAL MEMORANDUM

TO: Bill Brownlee/ M3 Eagle, LLC, / Eagle, Idaho

FROM: Ed Squires/ Hydro Logic, Inc. / Boise, Idaho

DATE: March 17, 2011

SUBJECT: M3 Eagle, LLC Ground Water-Level/Production Monitoring Plan

REGISTERED PROFESSIONAL GEOLOGIST
EDWARD SQUIRES
968
STATE OF IDAHO

OVERVIEW

M3 Eagle, LLC (M3) was granted water right Permit No. 63-32573 on January 25, 2010 for municipal purposes at an instantaneous flow-rate of 3.28 cubic feet per second[1]. Two of the conditions of approval for the water right No. 63-32573 are related to monitoring of ground water production and water levels from a series of existing and to-be-constructed wells for the M3 development. Specifically these conditions state:

> *"Prior to the diversion and use of water under this approval, the right holder shall install and maintain acceptable measuring device(s), including data logger(s), at the authorized point(s) of diversion, in accordance with Department specifications."*
>
> *"Prior to the diversion of water in connection with this water right, the right holder shall provide the Department with a plan for monitoring ground water levels in the vicinity of the place of use for this water right. The monitoring should occur in parallel with development and production and should include identification of non-producing wells and timelines for measuring and reporting. The right holder shall not divert water in connection with this right until the monitoring plan is approved by the Department. Failure to comply with the monitoring plan once it is accepted shall be cause for the Department to cancel or revoke this right."*

In compliance with these conditions, and to monitor its own effects from pumping, M3 contracted with Hydro Logic, Inc. (HLI) to develop and formalize a water level/water production monitoring and reporting plan. Seven zones within five long-term designated (non-producing) wells have been identified for water level monitoring (Figures 1 and 2). From previous aquifer testing results, it can be shown that the seven-zone network will be a good indication of groundwater levels on and around the M3 property. In addition to the seven-zone, five-well monitoring network, ground water levels and pumped ground water volume will be monitored in all water supply production wells as they are constructed and brought into production. The details of the monitoring plan, including the protocols, instrumentation, types of measurements, proposed timelines for measuring, and reporting requirements are presented below:

[1] The permitted quantity is subject to change pending the outcome of a judicial review action filed by M3 in Ada County District Court entitled *M3 Eagle v. Idaho Department of Water Resources*, Case No. CV OC 1003180.

WELLS TO BE MONITORED

The following wells have been selected for initial on-going monitoring at the locations shown on Figures 1 and 2: TW#1- Zones 3 and 5, TW#2- Zone 1, TW #3-Zone 4, TW#4-Zones 2 and 4, SVR#7 and SVR#9. Four of these (TW#1, TW#2, TW#3, and TW#4) are existing long-term designated monitoring wells constructed by M3 specifically for monitoring. One additional non-producing well proposed for monitoring is SVR#9; an existing well drilled on the property prior to the time it was purchased by M3. Two producing wells for water right No. 63-32573 are currently in existence: SVR#7 and Kling Irrigation wells. These supply wells and all other supply wells to be constructed and/or used under water right No. 63-32573, shall be equipped for monitoring water levels and water production volume as detailed below.

M3 shall grant IDWR reasonable access to these wells for purposes of monitoring and analyzing ground water. If M3 constructs an additional monitoring well on its property, such well shall be subject to monitoring and reporting requirements in this Monitoring Plan.

MONITORING RESPONSIBILITY

M3, as the current water right holder, has the primary responsibility for its ground water monitoring and reporting obligations to IDWR. Currently, M3 has charged Ed Squires of HLI with operating its monitoring network and to interpret and report its findings[2]. HLI can be contacted at:

Hydro Logic, Inc.
1002 W. Franklin Street
Boise, Idaho 83702
(208) 342-8369 office
ed@hydrologicinc.net e-mail

MONITORING INSTRUMENTS AND EQUIPMENT

All ground water level measurements will be obtained from a combination of electronic pressure-transducer/digital data-loggers calibrated to, and verified with, periodic manual measurements using chalked-steel tapes and non-stretch electric well sounders. The digital water level measurements[3] are taken with *Solinst Gold Levelogger®* (or equivalent) non-vented data-loggers suspended within dedicated monitoring tubes using stainless steel and/or Kevlar® braided cable. A digital barometric data-logger, such as a *Solinst Barologger®* (or equivalent), installed inside of a well located on M3 property, will be used to record changing atmospheric pressure and to compensate the pressure readings of the unvented data loggers by subtracting the component of water level fluctuations caused solely by changes in barometric pressure. Manual

[2] Hydro Logic, Inc. is currently contracted to conduct M3's monitoring but this function shall be accomplished by whatever consultant is hired by M3, by M3 itself, or by M3's successors.

[3] The pressure-transducer/data-logger measures the weight of the water column over the instrument (plus barometric pressure). The weight of the water column is converted to feet of water over the pressure-transducer by the software of the instrument. To convert these pressures to depth-to-water, the thickness of the water column over the transducer must first be subtracted. The hand-measured depth-to-water is then added to the corresponding data-point and used to calibrate the digital data.

water level measurements, using chalked-steel tapes, such as *Lufkin®* brand spring steel tapes, and/or non-stretch electric water level tapes, such as manufactured by *Testwell Instruments®* will be used to convert the water level pressures to depth-to-water measurements. All hand measurements will be recorded and reported to 0.01 foot.

MEASUREMENT INTERVALS

All electronic data loggers will measure and record water levels at 12-hour intervals.[4] Manual on-site measurements will be taken at a minimum of six times per year: a minimum of three during the seasonal high water-level period (January through early March) and a minimum of three during the seasonal low water-level period (September through October).

WATER LEVEL PROCESSING AND ANALYSIS

Each data logger will be removed from the well and connected to a portable computer (PC) for data uploading. The data from the digital instrument (time and pressure) will be transferred to the PC, brought back to the office and then processed using *MS Excel®*. Raw data logger readings first will be converted to pressure above the data logger by subtracting the simultaneously-measured atmospheric pressure (*Barologger®* or equivalent) data. All the digitally-measured water levels will be converted to depth-to-water measurements using the manually-measured water level recorded prior to removal of the data logger. The Barometric Efficiency (BE) effects of the aquifer[5] will also be removed using the method outlined in the Ground Water Manual (US Department of the Interior, 1981).

The following equation is the accepted industry standard for aquifer BE corrections and will be used in the interpretive reports:

$$WL_{aquifer} = WL_{well} + [(P_t - P_{ave}) * BE]$$

$WL_{aquifer}$	=	corrected depth-to-water in the aquifer, in feet
WL_{well}	=	depth-to-water in the well calibrated to the manual measurement, in feet
P_{ave}	=	mean atmospheric pressure for the year, in feet of water
P_t	=	atmospheric pressure at the time of each measurement, in feet of water
BE	=	dimensionless scaling factor of Barometric Efficiency (varies 0 to 1.0)

The BE correction factor applied to each well will be calculated from water levels and atmospheric pressure data recorded during periods when no pumping is occurring in the vicinity of the M3 property and seasonal water-level-trend effects are relatively small. The BE correction

[4] For long-term monitoring, and to ensure longer battery life and manageable data file size, two daily measurements (noon and midnight) are considered optimal.

[5] Barometric Efficiency ("BE") of an aquifer describes how changes in barometric pressure affect water levels (or pressures) in the *aquifer* compared with how the same change in barometric pressure affect water levels in a *well* open to the atmosphere. In an aquifer with a BE of 50 percent, a barometrically-caused change in *well* water level of 1 foot, results in a change in *aquifer* water level (or pressure) of 0.5 feet. Well water level data are corrected for BE to indicate what the water levels in the aquifer would be, were there no well (open to the atmosphere) completed in the aquifer. Calculation of BE is somewhat subjective to the assumptions and interpretation of the analyst. Therefore, it is an interpretation rather than data and the calculation of BE will be included in the interpretive Monitoring Reports of this monitoring plan.

factor used in interpretive reports will be based on the best available data from the monitoring. If better data become available and a better BE correction factor becomes available, then the improved value and its derivation shall be discussed in the monitoring interpretive report ("Monitoring Report" described in "Interpretation and Reporting" section). The raw data to be processed and analyzed will be submitted to IDWR twice per year as described below in the Interpretation and Reporting section of this report.

Individual well head equipment and measurement protocols are listed, by well, in the tables below. Photos of the six wellheads and reference measurement point distances above ground level are shown in Figure 3.

WELL HEAD CONFIGURATIONS AND FIELD-MONITORING PROTOCOL

1. **Well TW #1 - Zone 3** (Figure 4).

   a. Flow-Meter:
      i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

   b. Monitoring Tube Well:
      i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.
      ii. The monitoring tube well is open to the PGSA through a 0.020-inch cut slot well screen installed over the depth interval 395-to-425 feet below ground level (bgl).
      iii. The well screen is enveloped with a graded (#8-#16) sand filter over the interval 305-to-425 feet bgl.
      iv. The monitoring tube is completed in the upper PGSA.
      v. The borehole of TW #1 is sealed both above and below Zone 3 with pressure-grouted, high-solids, bentonite grout.
      vi. TW #1 is protected by a locking, bullet resistant, steel well head enclosure.

   c. Digital Data Acquisition:
      i. A Model # 3001 LT F65 "Levelogger" ® data-logger/pressure-transducer, produced by Solinst Canada, or equivalent, will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
      ii. The instrument will record a combination of pressure of water over the transducer and atmospheric pressure along with time of measurement. Measurement accuracy of the instrument will be 0.05 percent of full scale (65 feet), or about 0.03 feet.
      iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 3.2 feet above ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,606.39 feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure will be opened and any tampering or damage to the casing noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape will be sterilized in a chlorine bleach solution.
   iii. The depth-to-water will be measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the wetted chalk at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement will be recorded.
   iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.
   v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable, and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC[6].
   vi. The data-logger is connected to a portable PC. Using the appropriate software and peripherals, the data from the data logger are transferred to the PC.
   vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.

[6] In the event vented pressure-transducer/data-loggers are used for monitoring, the instruments would not have to be removed from the well. Rather, the instruments could be downloaded directly to the PC via the vent/data cable at the well head.

viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.
ix. The data logger is returned to the monitoring tube well and the depth-to-water re-measured as per step iii, above.
x. The steel well head security enclosure is closed, locked, and the lock closure double-checked.

2. **Well TW #1 - Zone 5** (Figure 4).

a. Flow-Meter:
   i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

b. Monitoring Tube Well:
   i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.
   ii. The monitoring tube well is open to the alluvial sand aquifer overlying the PGSA through a 0.020-inch cut slot well screen installed over the depth interval 97-to-137 feet below ground level (bgl).
   iii. The well screen is enveloped with a graded (#8-#16) sand filter over the interval 67-to-144 feet bgl.
   iv. The monitoring tube well is completed into the alluvial sand aquifer overlying the PGSA.
   v. The borehole of TW #1 is sealed both above and below Zone 5 with pressure-grouted, high-solids, bentonite grout.
   vi. TW #1 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records a combination of pressure of water over the transducer and atmospheric pressure along with the time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 3.2 feet above ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,606.39 feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure will be opened and any tampering or damage to the casing noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape will be sterilized in a chlorine bleach solution.
   iii. The depth-to-water will be measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement will be recorded.
   iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.
   v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable, and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.
   vi. The data-logger is connected to a portable PC. Using the appropriate software and peripherals, the data from the data logger are transferred to the PC.
   vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.
   viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.
   ix. The data logger is returned to the monitoring tube and the depth-to-water re-measured as per step iii, above.
   x. The steel well head security enclosure is closed, locked, and the lock closure double-checked.

3. **Well TW #2 - Zone 1** (Figure 5).

a. Flow-Meter:
   i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

b. Monitoring Tube Well:
   i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.
   ii. The monitoring tube well is open to the PGSA through a 0.020-inch cut slot well screen installed over the depth interval 270-to-320 feet bgl.
   iii. The well screen is enveloped with a graded (#6-#12) sand filter over the interval 259-to-334 feet bgl.
   iv. The monitoring tube is completed in the lower PGSA.
   v. The borehole of TW #2 is sealed both above and below Zone 1 with pressure-grouted, high-solids, bentonite grout.
   vi. TW #2 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records a combination of pressure of water over the transducer and atmospheric pressure along with time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 3.2 feet above ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,766.01 feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:

i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).

ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.

iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.

iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.

v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.

vi. The data-logger is connected to a portable PC. Using the appropriate software and peripherals, the data from the data logger are transferred to the PC.

vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.

viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.

ix. The data logger is returned to the monitoring tube and the depth-to-water re-measured as per step iii, above.

x. The steel well head security enclosure is closed, locked, and the lock double-checked.

4. **Well TW #3 - Zone 4** (Figure 6).

a. Flow-Meter:

i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

b. Monitoring Tube Well:

i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.

ii. The monitoring tube well is open to the PGSA through a 0.020-inch cut slot well screen installed over the depth interval 334-to-354 feet bgl.
iii. The well screen is enveloped with a graded (#8-#16) sand filter over the interval 303-to-355 feet bgl.
iv. The monitoring tube well is completed in the upper PGSA.
v. The borehole of TW #3 is sealed both above and below Zone 4 with pressure-grouted, high-solids, bentonite grout.
vi. TW #3 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or Kevlar® cable.
   ii. This instrument records a combination of pressure of water over the transducer and atmospheric pressure along with the time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 3.5 feet above ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,786.63 feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.
   iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-

water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.

iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.

v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.

vi. The data-logger is connected to a portable PC. Using the appropriate software, the data from the data logger are transferred to the PC.

vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.

viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.

ix. The data logger is returned to the monitoring tube and the depth-to-water re-measured as per step iii, above.

x. The steel well head security enclosure is closed and locked with the lock double-checked.

5. **Well TW #4 - Zone 2** (Figure 7).

a. Flow-Meter:

i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

b. Monitoring Tube Well:

i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.

ii. The monitoring tube well is open to the PGSA through a 0.020-inch cut slot well screen installed over the depth interval 326-to-556 feet bgl.

iii. The well screen is enveloped with a graded (#8-#16) sand filter over the interval 298-to-564 feet bgl.

iv. The monitoring tube well is fully penetrating and open to the full thickness of the PGSA.

v. The borehole of TW #4 is sealed both above and below Zone 2 with pressure-grouted, high-solids, bentonite grout.

vi. TW #4 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records pressure of water over the transducer and time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 4.15 feet above ground level (Figure 3).
   ii. The measuring point datum is about 2,675 (+/- 15 feet) (Google Earth) feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.
   iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "removed" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.

iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.
v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.
vi. The data-logger is connected to a portable PC. Using the appropriate software, the data from the data logger are transferred to the PC.
vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.
viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.
ix. The data logger is returned to the monitoring tube well and the depth-to-water re-measured as per step iii, above.
x. The steel well head security enclosure is closed and locked.

6. **Well TW #4 - Zone 3** (Figure 7).

a. Flow-Meter:
   i. This is a dedicated monitoring well and will not be pumped except for short-term, low-volume water sampling purposes.

b. Monitoring Tube Well:
   i. A designated 2-inch diameter, schedule 80 PVC plastic monitoring tube well is installed within the steel wellhead enclosure.
   ii. The monitoring tube well is open to the unnamed alluvial sand aquifer through a 0.020-inch cut slot well screen installed over the depth interval 181-to-201 feet bgl.
   iii. The well screen is enveloped with a graded (#8-#16) sand filter over the interval 166-to-211 feet bgl.
   iv. The monitoring tube is fully penetrating and open to the full thickness of the unnamed alluvial sand aquifer.
   v. The borehole of TW #4 is sealed both above and below Zone 3 with pressure-grouted, high-solids, bentonite grout.
   vi. TW #4 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records pressure of water over the transducer along with the time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in

the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the top of the steel well head enclosure which is 4.15 feet above ground level (Figure 3).
   ii. The measuring point datum is about 2,675 (+/- 15 feet) (Google Earth) feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.
   iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.
   iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.
   v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable and cap to the 2-inch PVC monitoring tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.
   vi. The data-logger is connected to a portable PC. Using the appropriate software, the data from the data logger are transferred to the PC.
   vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.
   viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.

ix. The data logger is returned to the monitoring tube and the depth-to-water re-measured as per step iii, above.
x. The steel well head security enclosure is closed and locked.

7. **Well SVR #9** (Figure 8).

a. Flow-Meter:
   i. This is a dedicated monitoring well and will not be pumped except for the possibility of periodic short-term, low-volume water sampling purposes.

b. Monitoring Tube:
   i. The well has no designated monitoring tube within the 8-inch diameter steel well casing.
   ii. The well is open to the PGSA through a wire-wound, stainless steel well screen with 0.030-inch openings over the interval 235-to-263 feet bgl.
   iii. The well screen is enveloped within a graded (#8-#12) sand filter.
   iv. The well is completed in the middle portion of the Pierce Gulch Sand but near the top of the PGSA (the saturated portion of the sand).
   v. The borehole of SVR #9 is sealed both above and below the well screen and filter-pack portion of the borehole with pressure-grouted, high-solids, bentonite grout.
   vi. SVR #9 is protected by a locking, bullet resistant, steel well head enclosure.

c. Digital Data Acquisition:
   i. A Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure-transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records a combination of pressure of water and atmospheric pressures over the transducer along with the time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

d. Measuring Datum:
   i. Measuring point is the inside edge of the open steel well head security enclosure which is 1.8 feet above ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,753.06 feet above mean sea level.

e. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.

ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

f. Monitoring Protocol:

i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).

ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.

iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.

iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.

v. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger and cable) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.

vi. The data-logger is connected to a portable PC. Using the appropriate software and peripherals, the data from the data logger are transferred to the PC.

vii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.

viii. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.

ix. The data logger is returned to depth inside of the casing and the depth-to-water re-measured as per step iii, above.

x. The steel well head security enclosure is closed, locked, and the lock double-checked.

8. **Well SVR #7** (Figure 9).

a. Flow-Meter:

i. This well has not yet been connected to any water system and no well head plumbing, controls, electrical power, or distribution water system has been constructed.

ii. All M3 water supply wells will be equipped with high-quality electromagnetic induction flow-meters manufactured by national suppliers prior to being brought on line.
iii. All flow-meters will either be new, factory-calibrated meters or, for used and/or aging meters, the meter will be calibrated every five years in the installed state. The rated flow range of the installed pumping plant and will indicate instantaneous flow and total volume pumped.

b. Measurements (when SVR #7 is on line and actively pumping):
   i. Water system personnel from M3 or its successor will visit all pumping wells at least one time per week.
   ii. Flow-meter totalizer readings, instantaneous flow rate readings, depth to water, and date and time of measurement will be manually recorded on a pump-house chart.

c. Monitoring Tubes:
   i. Two designated 1-inch diameter, plastic monitoring tubes will be installed with and attached to, the pump column with the lower end just above the pump bowl assembly.
   ii. The well is open to the PGSA through combined intake section consisting of a louvered "shutter screen" open to the aquifer from 279-to-339 feet below ground level and a cut-slot well screen with $^{1}/_{8}$-inch openings from 339-to-349 feet bgl.
   iii. The well screen is enveloped inside of a $^{5}/_{16}$-minus, crushed and washed basalt rock-chip-gravel pack over the interval 242-to-380 feet bgl.
   iv. The well is completed in the middle section of the PGSA.
   v. The borehole of SVR #7 is sealed both above and below the screened section with pressure-grouted, high-solids, bentonite grout.
   vi. SVR #7 is currently protected by a locking, bullet resistant, steel well head enclosure. When a distribution system is constructed, a well house may be built and the existing steel well head modified.
   vii. Any changes in grade and/or well head elevation will be carefully documented to maintain a consistent measuring datum.

d. Digital Data Acquisition:
   i. As long as this well is used solely for monitoring purposes, a Model # 3001 LT F65 "*Levelogger*" ® data-logger/pressure- transducer, produced by Solinst Canada (or equivalent), will be suspended within the well on a $^{1}/_{16}$-inch diameter braided stainless steel or *Kevlar*® cable.
   ii. This instrument records a combination of pressure of water and atmospheric pressure over the transducer along with the time of measurement. Measurement accuracy of the instrument is 0.05 percent of full scale (65 feet), or about 0.03 feet.
   iii. The serial number of the installed instrument will be recorded on the raw data files. If a replacement data logger is required, a description of the new data logger, its serial number, its range and accuracy will be noted in the raw data files. An explanation for any instrument replacements will be included in the next interpretative report prepared after replacement.

iv. When SVR#7 is equipped and used as a water supply well, it will be similarly equipped with the same monitoring devices used to monitor all other production wells depending on the equipment specified for the water system.

e. Measuring Datum:
   i. Measuring point is inside upper edge of the open steel well head enclosure which is currently 5.5 feet above the ground level (Figure 3).
   ii. The surveyed (survey-grade GPS) measuring point datum is 2,709.84 feet above mean sea level.

f. Barometric Efficiency:
   i. The barometric efficiency (BE) of this well will be calculated from the best available data as described above and reported in the interpretive reports.
   ii. The annual mean of the recorded fluctuations of the variations in atmospheric pressure, as measured by the M3 site barometer, will be calculated from the monitored data.

g. Monitoring Protocol:
   i. With each site visit, the locking steel well head enclosure is opened and any tampering or damage to the casing is noted along with weather conditions (temperature, precipitation or any other factors that might affect data reading or reporting).
   ii. The lower 5 feet of the clean chalked-steel water level tape is sterilized in a chlorine bleach solution.
   iii. The depth-to-water is measured to the nearest 0.01 ft using a hand-held chalked-steel tape measure (with readings to 0.01 ft). A chalk block is rubbed on both sides of the lower five to ten feet of the tape. The depth-to-water is measured to the inside lip of the open well head enclosure (Figure 3). The tape is lowered to a depth that is about 3 feet more than the last recorded water level. The length of the tape relative to the measuring point is recorded as the "held" portion of the tape. The tape is withdrawn from the well and the length of the chalk wetted at the bottom of the tape is recorded as the "cut" portion of the tape. The total depth-to-water from the measuring point is calculated by subtracting the value recorded as "cut" from the value recorded as "held." The total depth-to-water from the measuring point and the time of measurement are recorded.
   iv. The depth-to-water measurement is repeated one or more times to verify its accuracy and repeatability.
   v. When SVR#7 well is brought into production, a chalked steel tape may not be an accurate means of measuring pumping and non-pumping water levels. In this case, and as will be the case with all pumping production wells, a non-stretch electric well sounding tape (such as manufactured by *Testwell Instruments*® shall be used to measure water levels to that same accuracy as specified for chalked steel tape measurements.
   vi. The data logger is then removed with the cable carefully wound up and the entire assembly (data logger, cable and cap to the 2-inch PVC monitoring

tube) is placed on a clean plastic tarp to maintain cleanliness of the logger assembly while the data is uploaded to the PC.

vii. The data-logger is connected to a portable PC. Using the appropriate software and peripherals, the data from the data logger are transferred to the PC.

viii. The data logger is reset (memory cleared) if and only if a previous upload of data has been duplicated and therefore verified.

ix. The battery life of the data-loggers will be taken into account and replaced before the expected lifetime of the instrument's to avoid problems.

x. The data logger is returned to the monitoring tube and the depth-to-water re-measured as per step iii, above.

xi. The steel well head security enclosure is closed and locked with the lock double-checked.

MONITORING EQUIPMENT, INSTRUMENTS, AND CALIBRATION

1) Measuring Instruments.

a. Water-level sounding tapes.

i. *Steel tapes.* Spring-steel tapes, such as manufactured by *Lufkin®*, specifically constructed for chalked water level measurements, incremented in one-foot intervals with the lowermost 20-feet of the tape embossed in 1/100th of a foot increments will be used to measure water levels. Recognizing that steel tapes stretch also (that is why Lufkin supplies a ruler with each steel tape), we did not compensate for these very small changes which we assumed to be constant once the tape is extended.

ii. *Monitoring tubes:* All wells will be equipped with designated monitoring tubes for measuring water levels without becoming entangled with the pump column or submersible power cables and to avoid "casing suck" whereby the tape can temporarily stick to the wetted steel casing.

iii. *Electric Water Level Sounding Tapes:* For pumping wells, and for any well unable to be measured by the chalked steel tape method, non-stretch electric water level sounders such as manufactured by *Testwell Instruments®* will be used to measure water levels to 0.01/ft.

b. Electronic data loggers:

i. Electronic data loggers installed in the designated (non-pumping) test wells require no periodic calibration or maintenance. If a data logger appears to be failing, it is returned to the manufacturer for repair, data recovery and/or replacement.

ii. All water supply production wells will be equipped with digital electronic equipment to measure and record system pressure, water-level, instantaneous flow, pumped volume, etc. as all high-quality municipal systems are required to do. These are generally standardized monitoring packages that are identical for each well and which report back to a centralized data recording system. The exact manufacturer and/or type of remote sensing and data-transmission system that will be used is not

currently designed or known but shall be from a nationally recognized manufacturer with a proven track record.

iii. All pressure-transducer/data-logging instruments will be housed inside of designated monitoring tubes within the well. Tube of sufficient rigidity and diameter will be used to ensure continued insertion and removal of the instruments to/from the well.

2) Permanently Installed Flow Meters.

a. Flow-Meter Type.

i. All M3 water production wells will be equipped with high-quality electromagnetic induction flow-meters manufactured by national suppliers prior to being brought on line. The precise equipment will be chosen according to cost, performance, and reliability.

b. Flow Range

i. All flow-meters will be within the calibrated and rated flow range of the installed pumping plant and will indicate instantaneous flow and total volume pumped.

c. Flow Meter Calibration.

i. All new high-quality flow-meters are factory-calibrated within close tolerances. Periodically, at approximately five-year intervals, flow-meter calibrations will be checked by means of pumped filling of tanks of known volume, by pumping tests using a circular orifice weir, or using another calibrated flow-meter.

ADDITIONAL WATER LEVEL DATA

After a new Supply Well has been constructed, it will be pump-tested following protocols established by IDEQ for Public Drinking Water Systems. The data from these tests will be submitted in electronic format to IDWR as part of the raw monitoring data collected for that year. These data will be analyzed, interpreted, and reported by the groundwater consultant preparing the interpretive monitoring reports (described below).

INTERPRETATION AND REPORTING

Semi-Annual Data Submittals: The raw electronic and hand-measured water level data, including data corrected for fluctuations in atmospheric pressure, for each well will be submitted to IDWR twice per year – once on or before December 31st (for data collected from June 1st-to-November 30th) and once on or before June 30th (for data collected from December 1st-to May 31st).[7] These data will be submitted to IDWR on compact disc in MS Excel®, non-encrypted format with column headings included at the beginning of the file, posted above each recorded data type. For pumping wells, the raw data submittal will include field and digitally-acquired

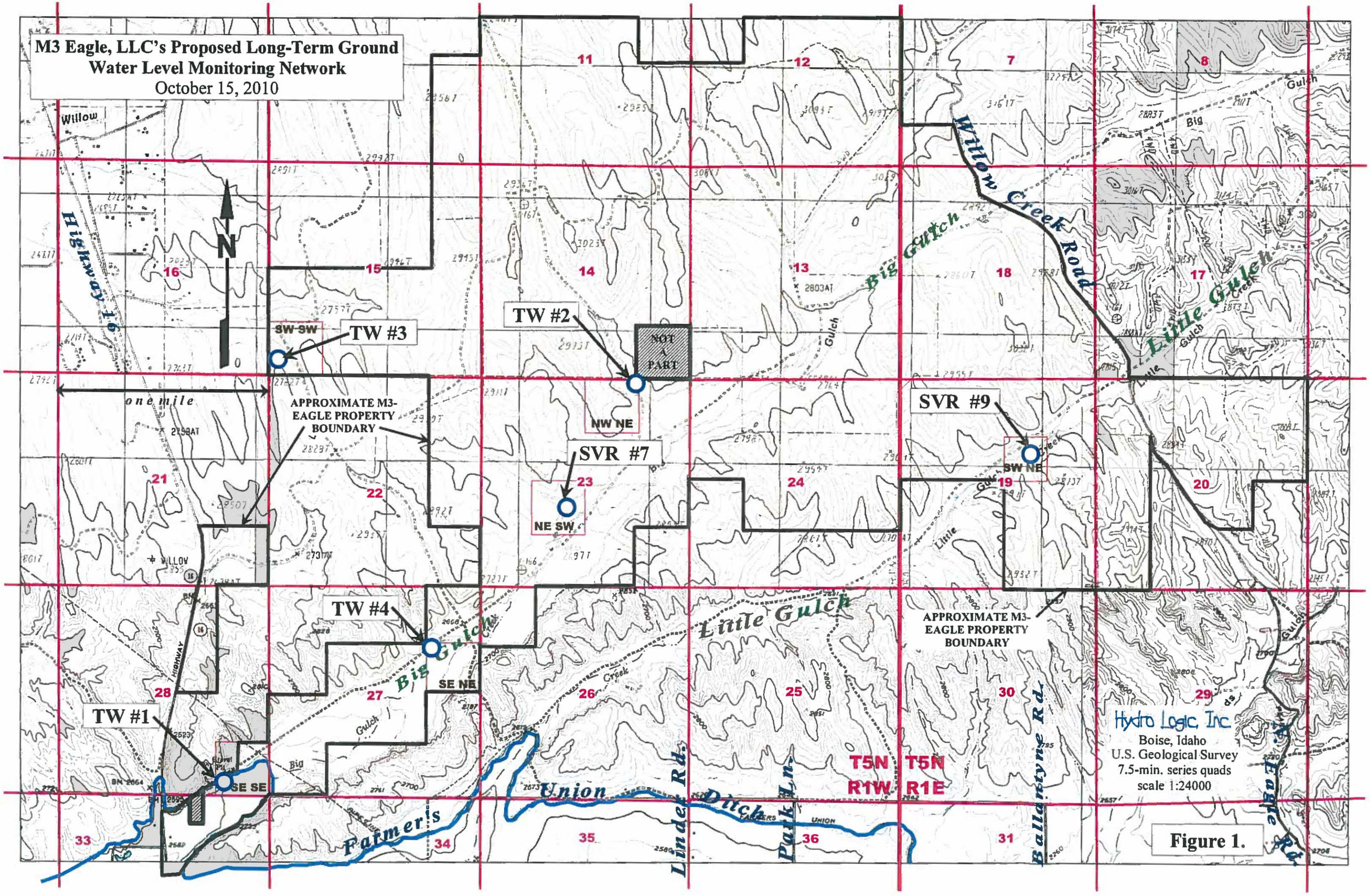
[7] The June 1-to-November 30 and December 1-to-May 31) monitoring periods are intended to ensure that the highest and lowest water levels of the year are measured and recorded. (The lowest levels have been shown to occur in September-October, while the highest levels occur during January-March.)

pumping and non-pumping water levels and pump house production data for all M3 water supply wells.

Annual Monitoring Report: On or before July 31 each year after pumping commences under the Permit, M3 shall prepare and file with IDWR an interpretive monitoring report by a professional hydrogeologist ("Monitoring Report") which shall include:

1) The amount, timing, and location of ground water production under the Permit.
2) Plotted hydrographs for each monitored well using BE-corrected data showing seasonal variations, water-level trends, and pumping effects, along with a discussion of water level trends, and notable changes in water levels, the high and low water level measurements recorded, and an explanation of any other factors that may be relative to the water levels in the Pierce Gulch Sand Aquifer (PGSA).
3) Drawdown calculations determined by comparison of the average water level at each monitoring well for each month during the most recent annual period with the average water level for the same month during the previous annual monitoring period(s) or similar information as may be required by the Department.
4) Other information describing hydrologic impacts of the water right holder's ground water pumping on senior surface and ground water users (to the extent data is available) and a determination of the cause(s) of any observed water level declines.
5) A discussion of the effects of the water right holder's ground water pumping on the shallow aquifer.
6) Any available updated information concerning projections for the project's impacts on the aquifer at full build out.

The monitoring and reporting requirements set forth herein shall remain in place throughout the Permit's 30 year planning horizon unless terminated sooner by order of the Department. If the Department determines that annual Monitoring Reports are not necessary to effectively administer water rights or evaluate impacts on the resource by the water right holder's pumping, the Department can reduce the frequency of the Monitoring Reports to once every five years or such other frequency the Department deems necessary.


M3 Eagle, LLC's Proposed Long-Term Ground Water Level Monitoring Network
October 15, 2010
TW #1
TW #2
TW #3
TW #4
SVR #7
SVR #9
SW SW
NW NE
NE SW
SE NE
SE SE
SW NE
NOT A PART
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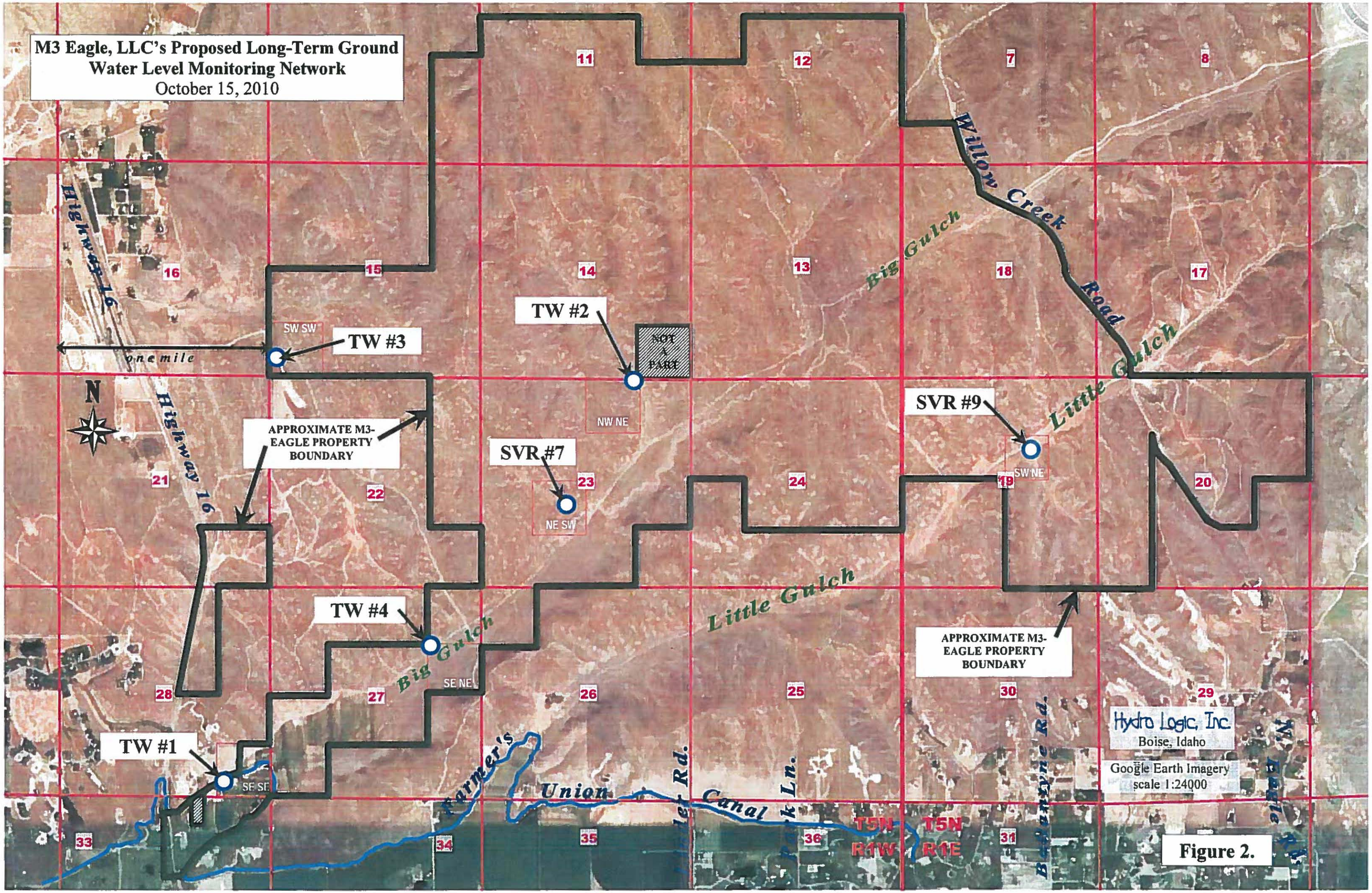
APPROXIMATE M3-EAGLE PROPERTY BOUNDARY
one mile
N
Highway 16
Willow Creek Road
Big Gulch
Little Gulch
Union Ditch
Farmers
Linder Rd.
Park Ln.
Ballantyne Rd.
T5N R1W
T5N R1E
Hydro Logic, Inc.
Boise, Idaho
U.S. Geological Survey
7.5-min. series quads
scale 1:24000

Figure 1.


M3 Eagle, LLC's Proposed Long-Term Ground Water Level Monitoring Network
October 15, 2010
TW #1
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TW #3
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APPROXIMATE M3-EAGLE PROPERTY BOUNDARY
APPROXIMATE M3-EAGLE PROPERTY BOUNDARY
NOT A PART
SW SW
NW NE
NE SW
SW NE
SE NE
SE SE
one mile
N
Highway 16
Highway 16
Willow Creek Road
Big Gulch
Little Gulch
Little Gulch
Big Gulch
Farmer's Union Canal
Hunter Rd.
Black Lk Ln.
Blaintyne Rd.
T5N R1W
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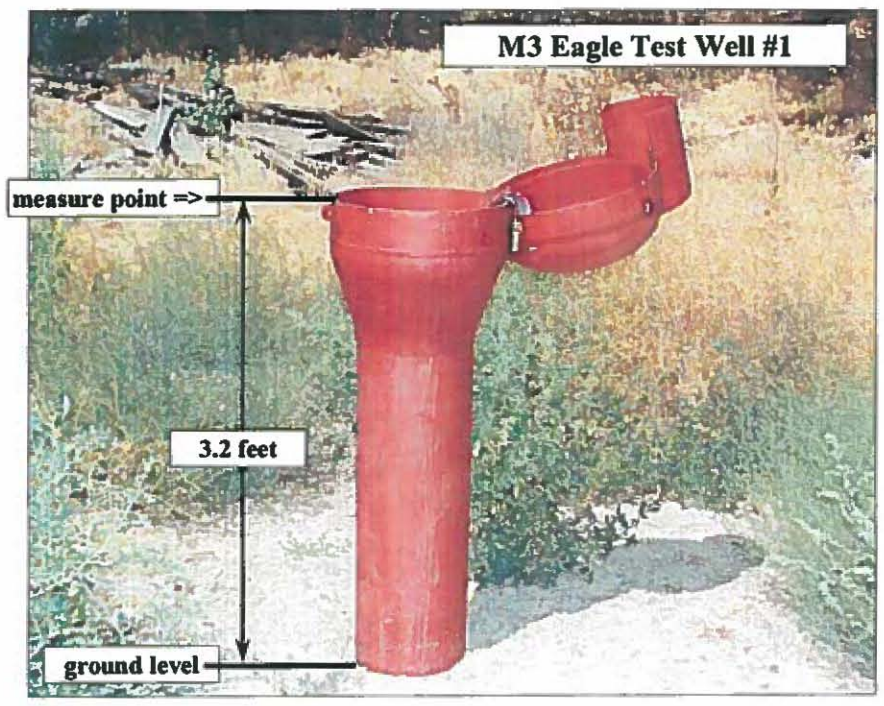
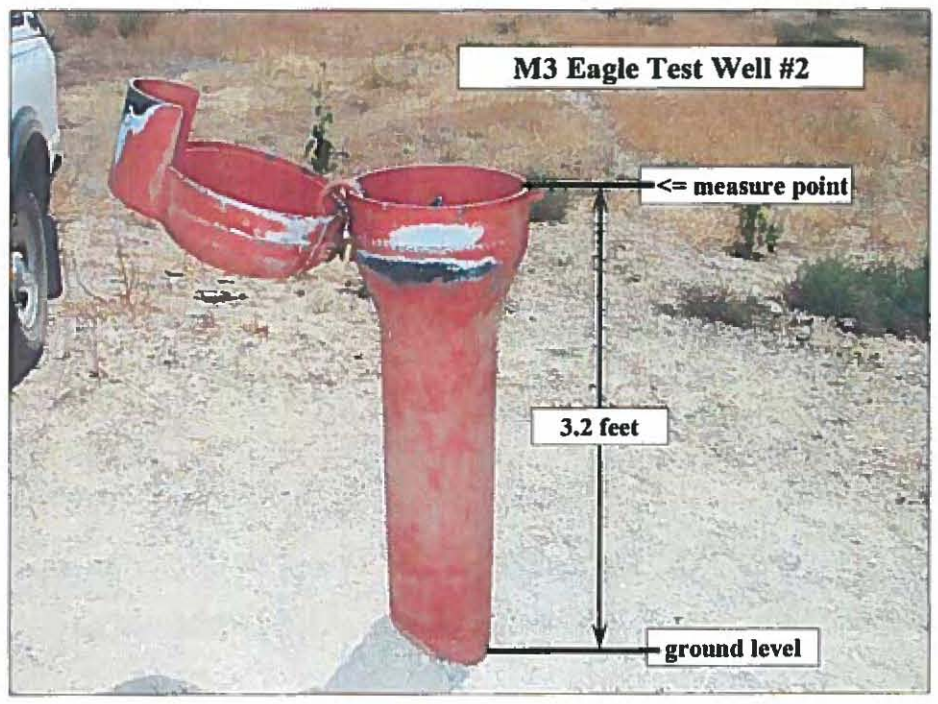
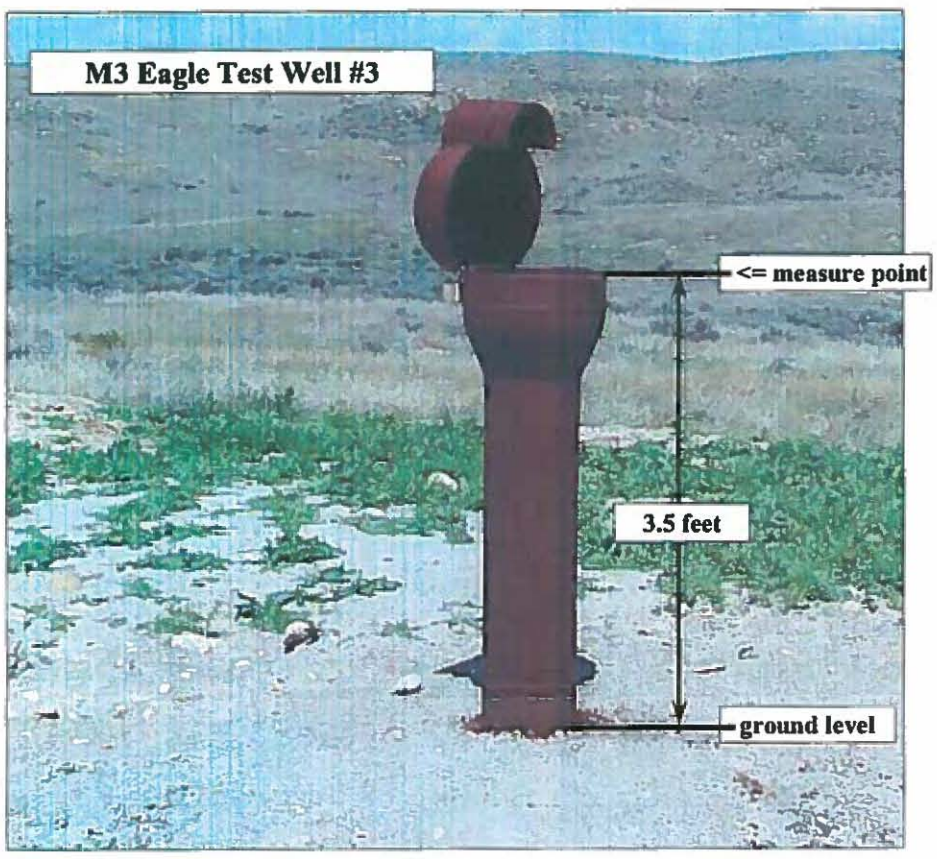
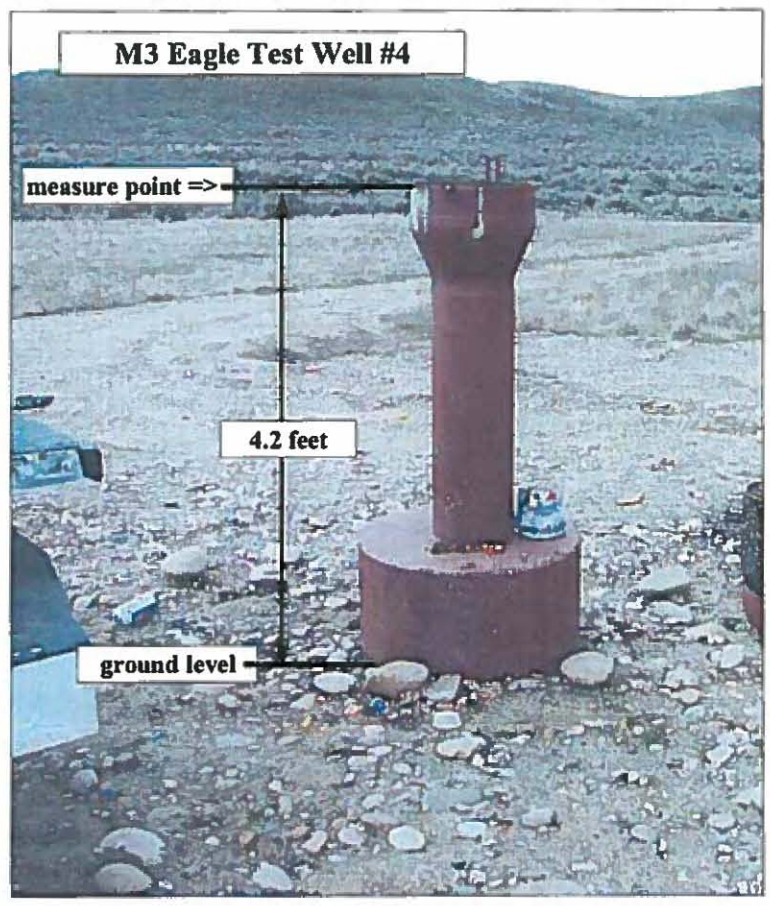
Hydro Logic, Inc.
Boise, Idaho
Google Earth Imagery
scale 1:24000

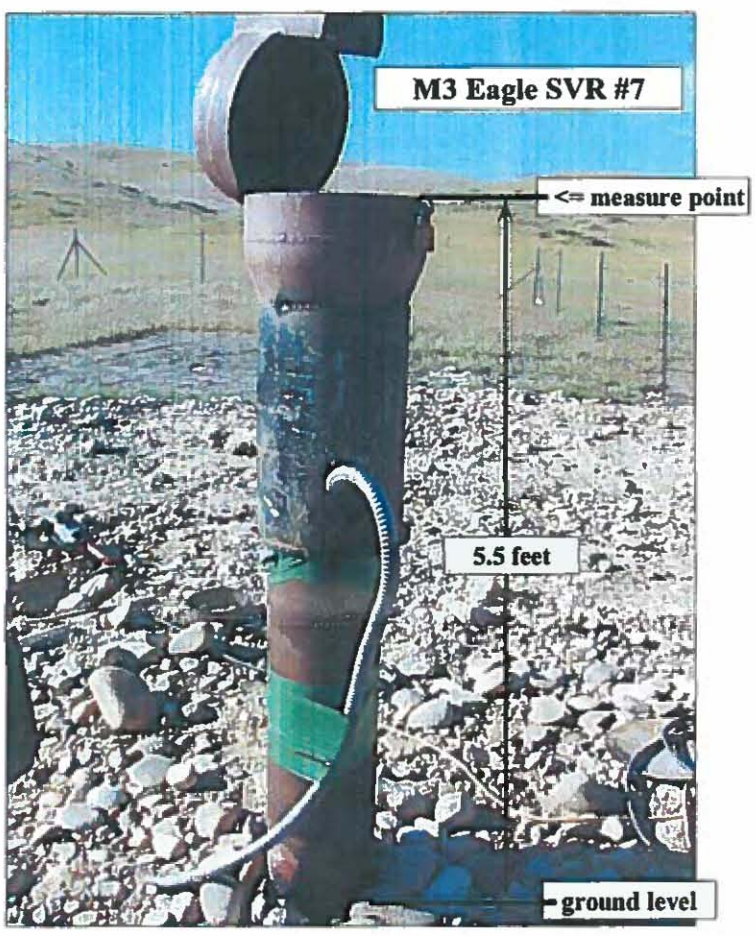
Figure 2.

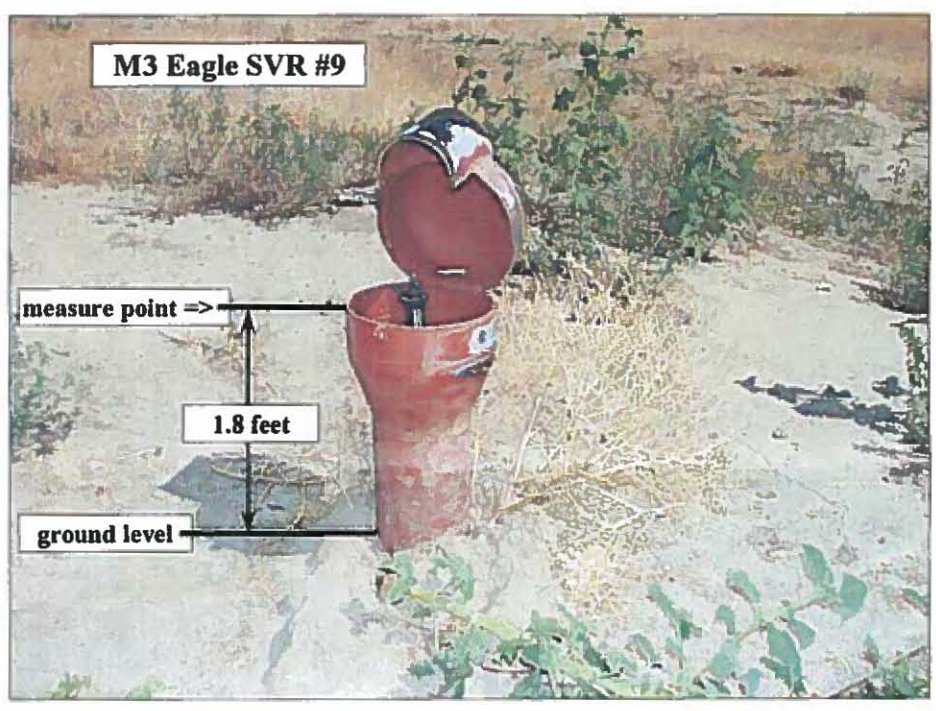












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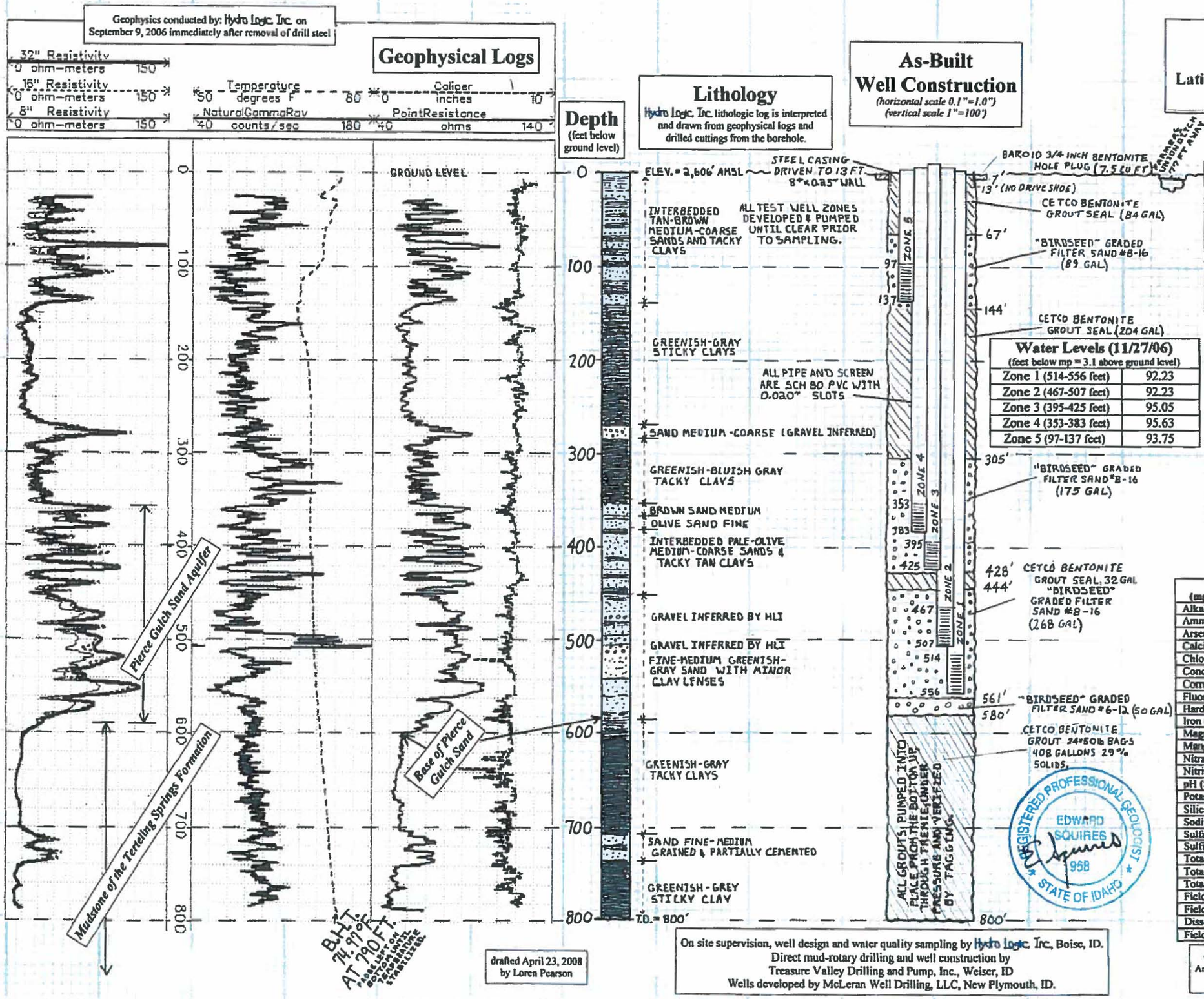
Boise, Idaho

Figure 3.

Figure 3. M3 Eagle Monitoring Well Measure Points

M3 Eagle - Test Well #1

T. 5 N., R. 1 W., Section 28, SE¼, SE¼
Latitude 43° 44' 12.37" Longitude 116° 27' 26.86"
Well completed September 2006



Water Levels (11/27/06)

(feet below mp = 3.1 above ground level)

Zone 1 (514-556 feet)	92.23
Zone 2 (467-507 feet)	92.23
Zone 3 (395-425 feet)	95.05
Zone 4 (353-383 feet)	95.63
Zone 5 (97-137 feet)	93.75

Water Chemistry

Analyte (mg/L unless noted)	Zone 1 514-556 feet	Zone 2 467-507 feet
Alkalinity	133.0	125.0
Ammonia as N	0.37	0.06
Arsenic	<0.003	<0.003
Calcium as CaCO3	84.4	85.5
Chloride	3.42	3.22
Conductivity (uS/cm)	302	297.0
Corrosivity	-0.40	-0.44
Fluoride	0.69	0.60
Hardness	111.0	109.0
Iron (dissolved/filtered)	0.23	<0.01
Magnesium	6.50	5.73
Manganese (dissolved)	0.10	0.02
Nitrate as N	<0.10	<0.10
Nitrite as N	<0.01	<0.01
pH (SU)	7.47	7.48
Potassium	2.26	2.21
Silica	31.8	30.7
Sodium	22.1	21.7
Sulfate	17.2	20.7
Sulfide	<0.05	<0.05
Total Dissolved Solids	173.0	188.0
Total Kjeldahl Nitrogen	0.39	0.13
Total Organic Carbon	<1.0	<1.0
Field Temperature (°F)	67.1	66.0
Field Conductivity (uS)	305	295
Dissolved Oxygen	+1.7	+2.6
Field pH (S.U.)	7.19	7.19

Analyses by Alchem Laboratories, Boise, Idaho.
Zones 1 to 3 sampled 10/09/06. Zones 4 & 5 sampled 10/9/06.
Field measured parameters by Hydro Logic, Inc.

Analyte (mg/L unless noted)	Zone 3 395-425 feet	Zone 4 352-382 feet	Zone 5 98-138 feet
Alkalinity	119.0	114.0	119.0
Ammonia as N	0.04	<0.01	<0.01
Arsenic	<0.003	0.0049	0.0081
Calcium as CaCO3	77.7	81.3	85.9
Chloride	3.57	3.54	4.36
Conductivity (uS/cm)	282.0	285.0	281.0
Corrosivity	-0.50	-0.61	-1.16
Fluoride	0.60	0.50	0.24
Hardness	102.0	105.0	111.0
Iron (dissolved/filtered)	0.01	<0.01	<0.01
Magnesium	5.83	5.85	6.22
Manganese (dissolved)	<0.01	<0.01	<0.01
Nitrate as N	0.30	0.33	2.30
Nitrite as N	<0.01	<0.01	<0.01
pH (SU)	7.84	7.40	6.91
Potassium	2.07	2.10	2.74
Silica	29.5	28.7	38.0
Sodium	21.1	17.9	13.6
Sulfate	21.4	22.3	12.0
Sulfide	<0.05	<0.05	<0.05
Total Dissolved Solids	185.0	203.0	208.0
Total Kjeldahl N	<0.10	<0.10	<0.10
Total Organic Carbon	<1.0	<1.0	<1.0
Field Temperature (°F)	64.7	63.8	57.4
Field Conductivity (uS)	274	268	265
Dissolved Oxygen	+4.9	+2.63	+9.51
Field pH (S.U.)	7.27	7.07	6.72

drafted April 23, 2008
by Loren Pearson

On site supervision, well design and water quality sampling by Hydro Logic, Inc., Boise, ID.
Direct mud-rotary drilling and well construction by
Treasure Valley Drilling and Pump, Inc., Weiser, ID
Wells developed by McLeran Well Drilling, LLC, New Plymouth, ID.

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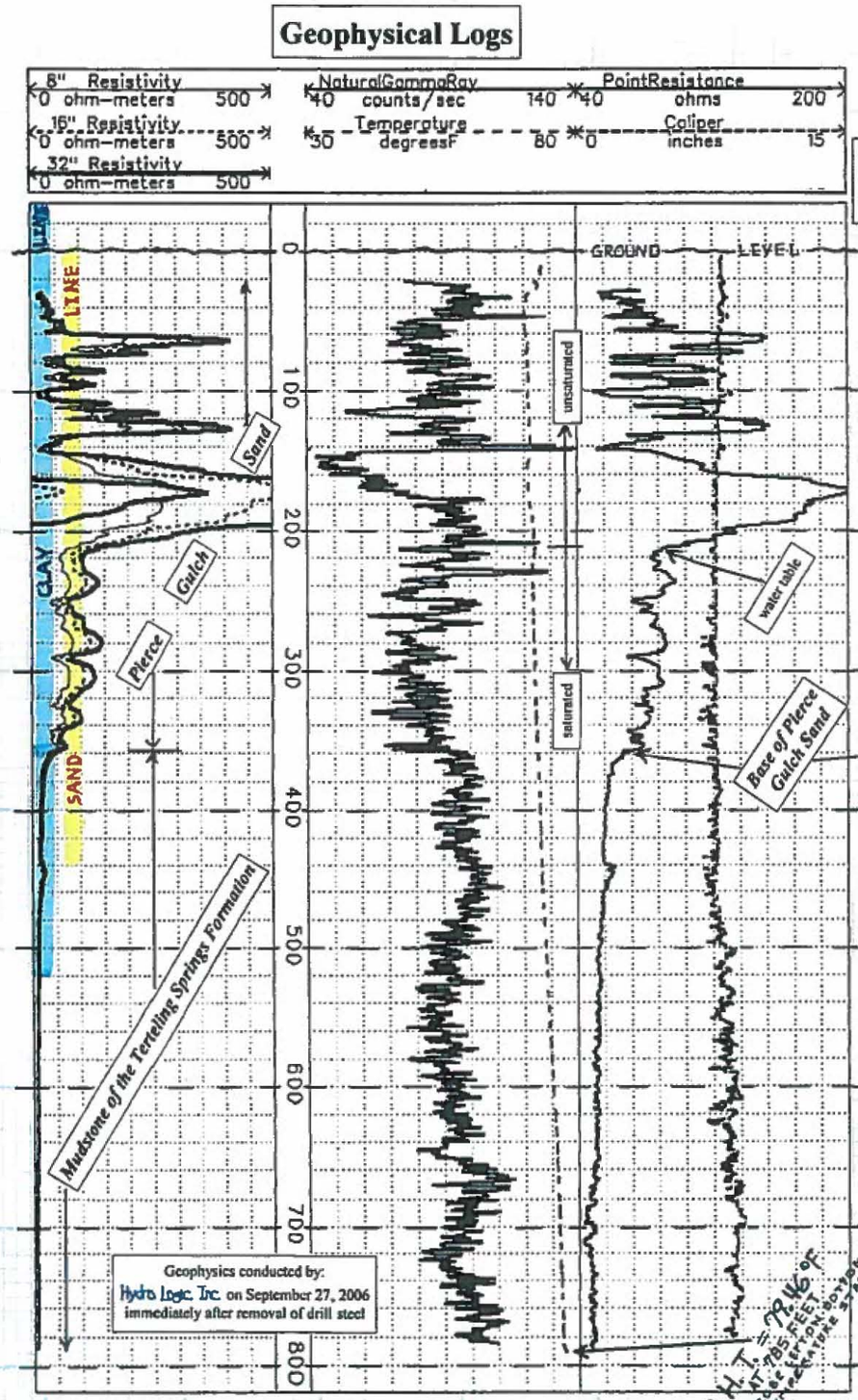
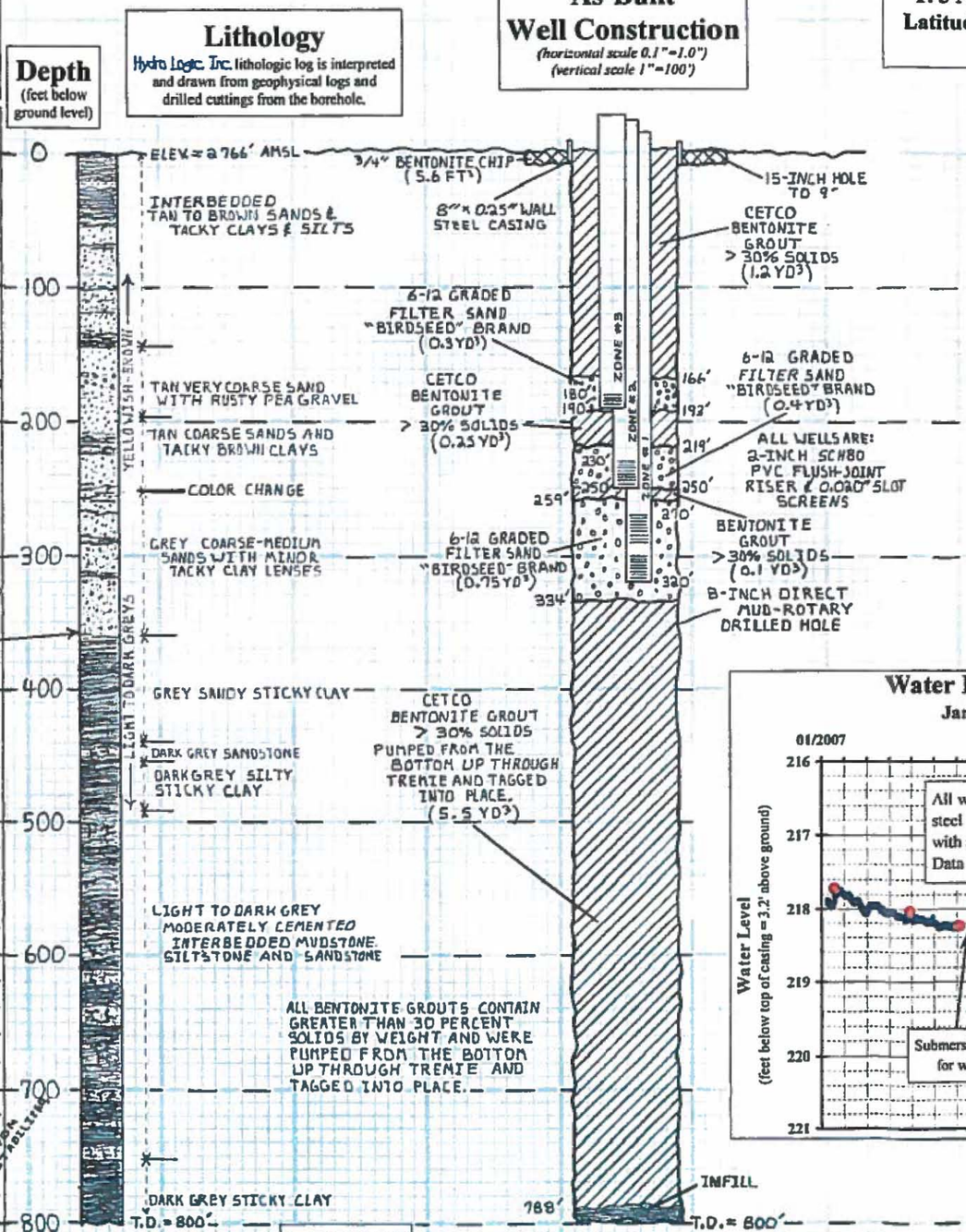
Figure 4.

M3 Eagle - Test Well #2

T. 5 N., R. 1 W., Section 23, NE¼, NW¼, NE¼
Latitude 43° 45' 50.63" Longitude 116° 25' 6.58"
Well completed October 2006





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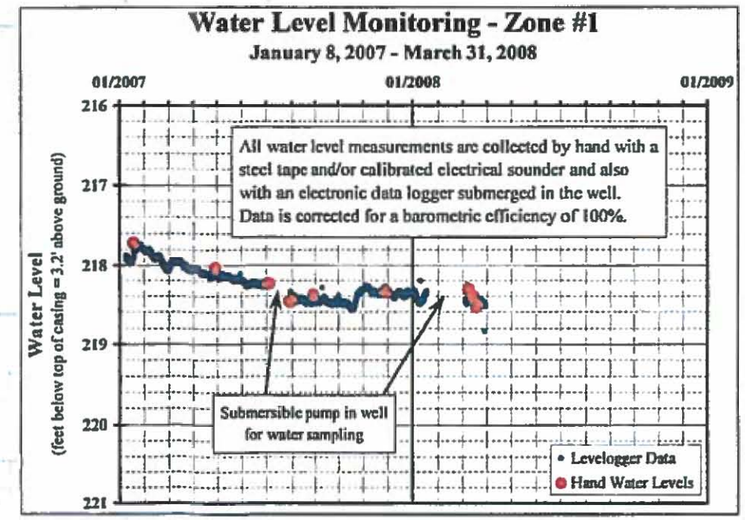
Water Levels

(feet below measure point = 3.0 feet above ground)

Date / Time (24-hr clock)	ZONE #1 (320 - 270 feet bgl)	ZONE #2 (250 - 230 feet bgl)	ZONE #3 (190 - 180 feet bgl)
10/10/06 13:05	216.87	-	unsaturated zone (installed to confirm water table depth)
11/07/06 12:00	217.23	217.36	
1/18/07 14:27	217.19	217.37	
4/30/07 15:25	216.97	215.76	
6/01/07 12:00	216.17	216.75	
7/24/07 12:30	-	217.11	
7/31/07 13:00	217.58	217.91	
8/30/07 12:20	217.60	217.93	
9/19/07 16:30	215.93	216.26	

Water levels recorded by Hydro Logic, Inc.



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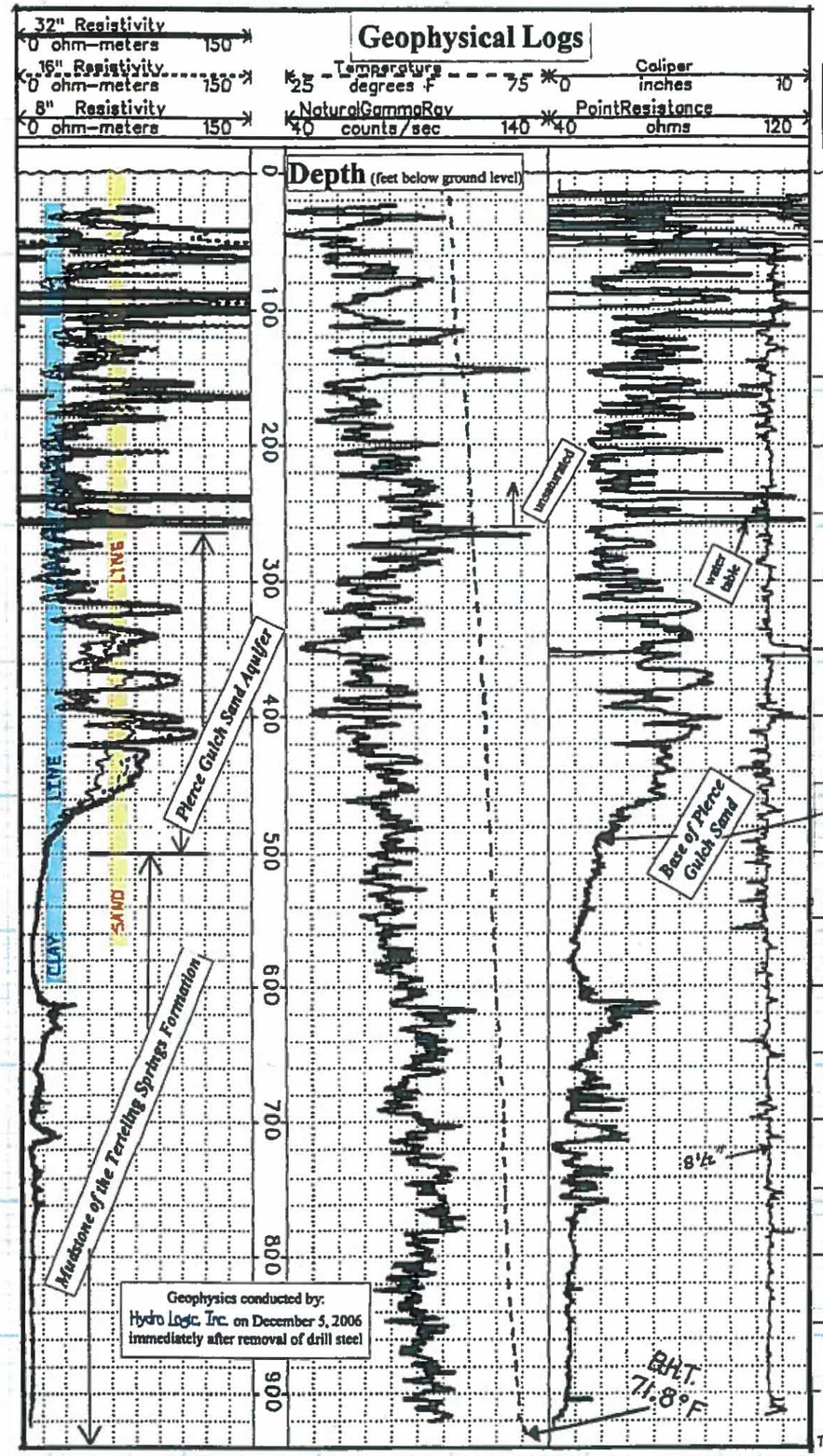
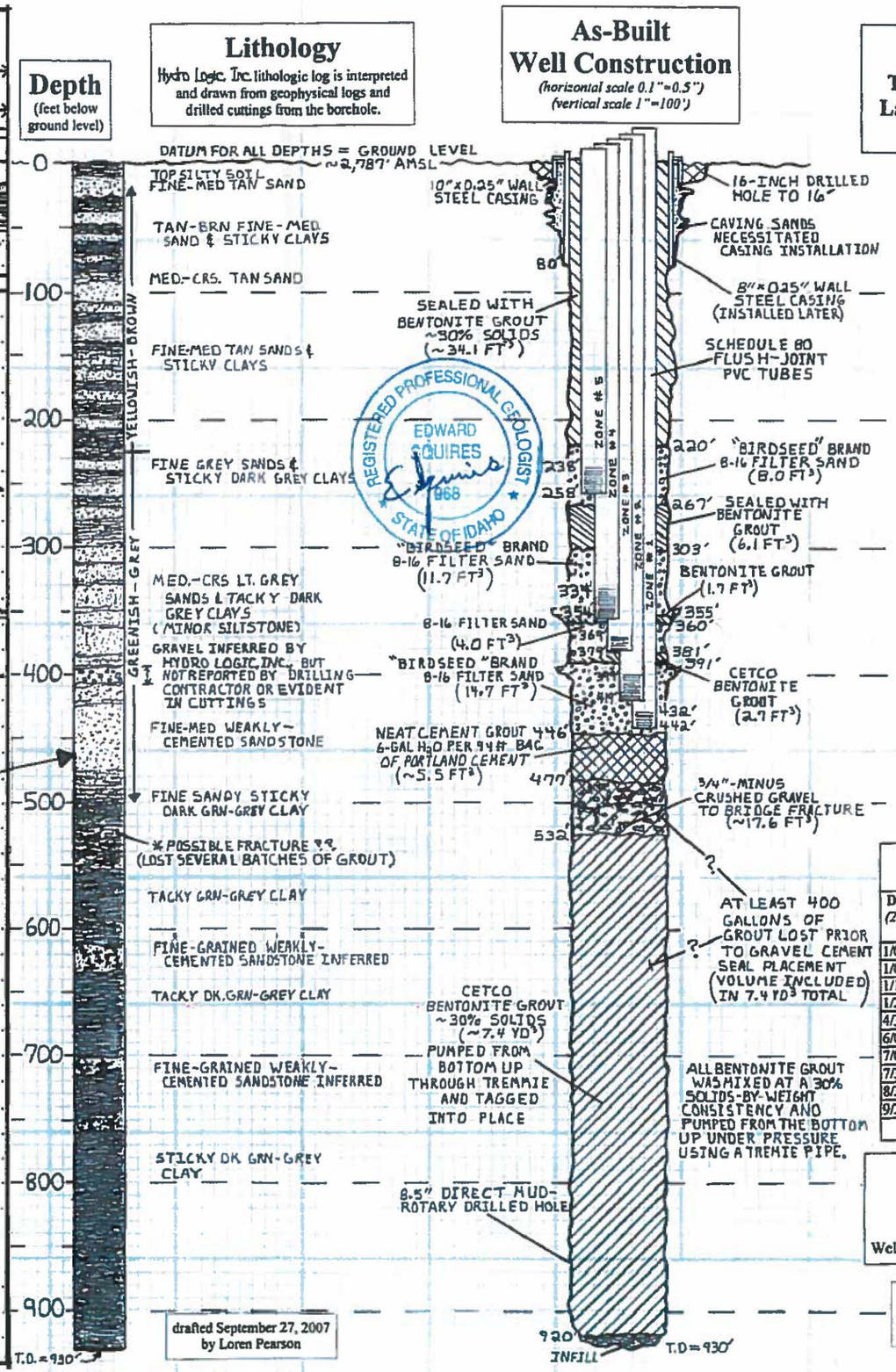
On site supervision, well design, pump test design, and water level monitoring by Hydro Logic, Inc., Boise, ID.
Direct mud-rotary drilling and well construction by Treasure Valley Drilling and Pump, Inc., Weiser, ID.
Wells developed by McLeran Well Drilling, LLC, New Plymouth, ID.

Figure 5.

M3 Eagle - Test Well #3

T. 5 N., R. 1 W., Section 15, SW¼, SW¼, SW¼
Latitude 43°45' 56.44" Longitude 116° 27' 8.35"
Well completed December, 2006





Ground Water Chemistry

Analysis (in mg/L unless noted)	ZONE #1 (442 - 432 feet bgl)	ZONE #2 (419 - 399 feet bgl)	ZONE #3 (379 - 369 feet bgl)
Alkalinity	136.0	123.0	117.0
Ammonia as N	0.28	0.14	0.05
Arsenic	0.008	0.005	0.009
Calcium as $CaCO_3$	69.8	74.8	86.5
Chloride	5.39	5.31	7.02
Conductivity (µS)	316.0	305.0	321.0
Corrosivity	-0.14	-0.46	-0.30
Fluoride	0.51	0.52	0.52
Hardness	98.4	106.0	118.0
Iron (dissolved)	0.16	0.09	0.03
Magnesium	6.94	7.48	7.47
Manganese (dissolved)	0.07	0.09	0.05
Nitrate as N	0.13	0.13	0.12
Nitrite as N	<0.01	<0.01	<0.01
Orthophosphate	0.477	0.270	0.276
pH - Lab (S.U.)	7.90	7.59	7.72
Potassium	2.90	2.54	2.53
Silica	43.5	41.2	35.8
Sodium	30.4	24.3	26.2
Sulfate	22.7	23.9	32.3
Sulfide	< 0.05	< 0.05	< 0.05
Total Dissolved Solids	253	235.0	238.0
Total Kjeldahl Nitrogen	0.35	0.23	0.18
Total Organic Carbon	1.34	< 1.0	< 1.0
Field Conductivity (µS)	310	307	321
Field Dissolved Oxygen	6.64	4.89	4.87
Field O.R.P. (mV)	+106	+6	+110
Field pH (S.U.)	7.62	7.22	7.46
Field Temperature (°F)	64.2	63.2	62.2

Analyses by Alchem Laboratories, Boise, ID
Samples collected on January 30, 2007 by Hydro Logic, Inc.

Water Levels

(feet below measure point = 3.5 feet above ground)

Date / Time (24-hr clock)	ZONE #1 (442 - 432 feet bgl)	ZONE #2 (419 - 399 feet bgl)	ZONE #3 (379 - 369 feet bgl)	ZONE #4 (354 - 334 feet bgl)	ZONE #5 (258 - 238 feet bgl)
1/05/07 13:05	261.42	261.48	261.68	261.79	unsaturated zone (installed to prove water table depth)
1/08/07 17:34	262.28	262.34	262.43	262.62	
1/18/07 10:07	263.30	263.34	263.42	263.60	
1/29/07 09:26	262.22	262.30	262.35	262.54	
4/30/07 11:39	262.62	262.63	262.71	262.90	
6/01/07 09:45	261.85	261.84	261.90	262.09	
7/03/07 09:54	262.34	263.74	263.81	263.99	
7/31/07 10:58	263.85	263.82	263.92	264.07	
8/30/07 10:01	263.93	263.95	263.96	264.18	
9/20/07 16:06	262.15	262.10	262.17	262.35	

Water levels recorded by Hydro Logic, Inc.

On site supervision, well design, pump test design, and water quality sampling by Hydro Logic, Inc., Boise, ID.
Direct mud-rotary drilling and well construction by Treasure Valley Drilling and Pump, Inc., Weiser, ID
Well development by McLeran Well Drilling, LLC, New Plymouth, ID.

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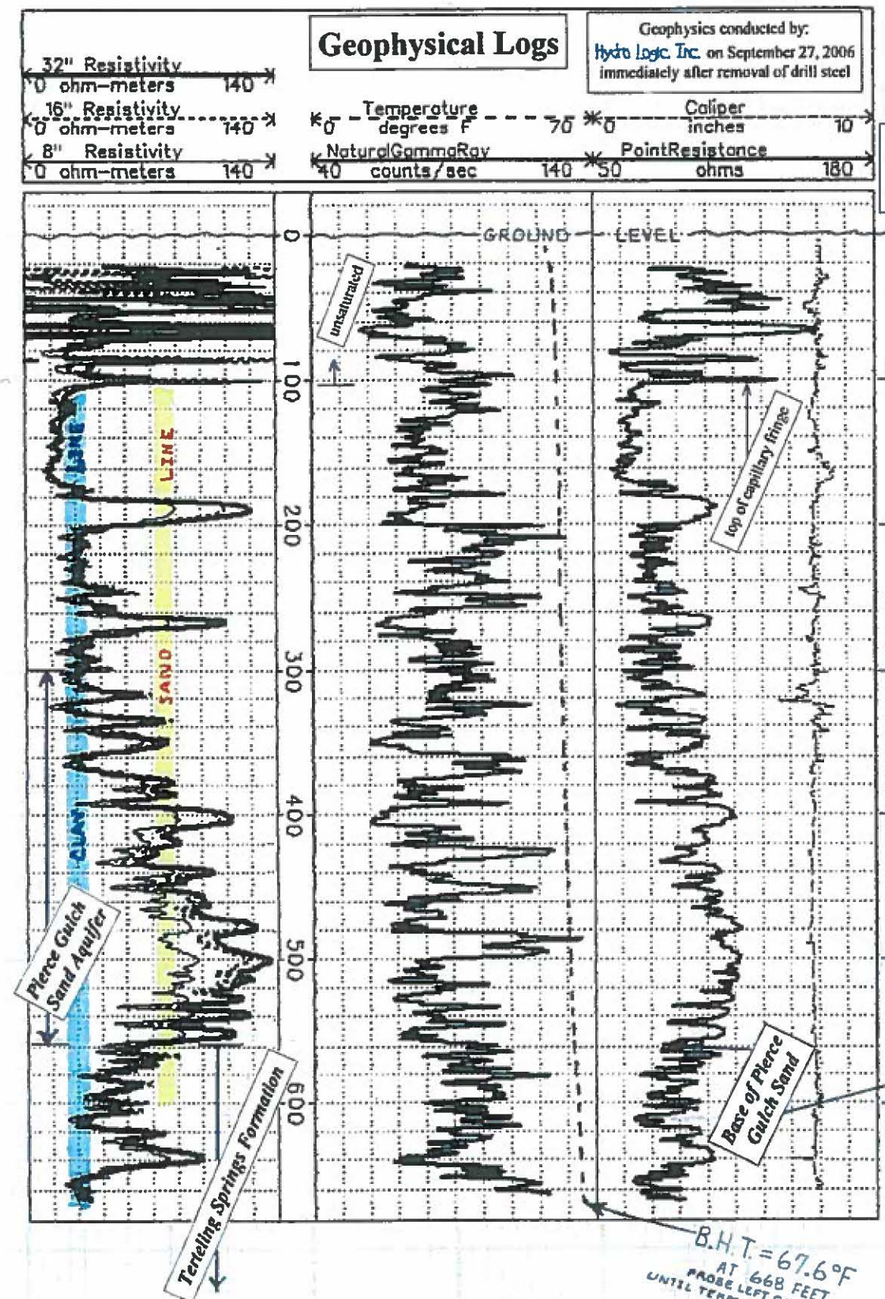
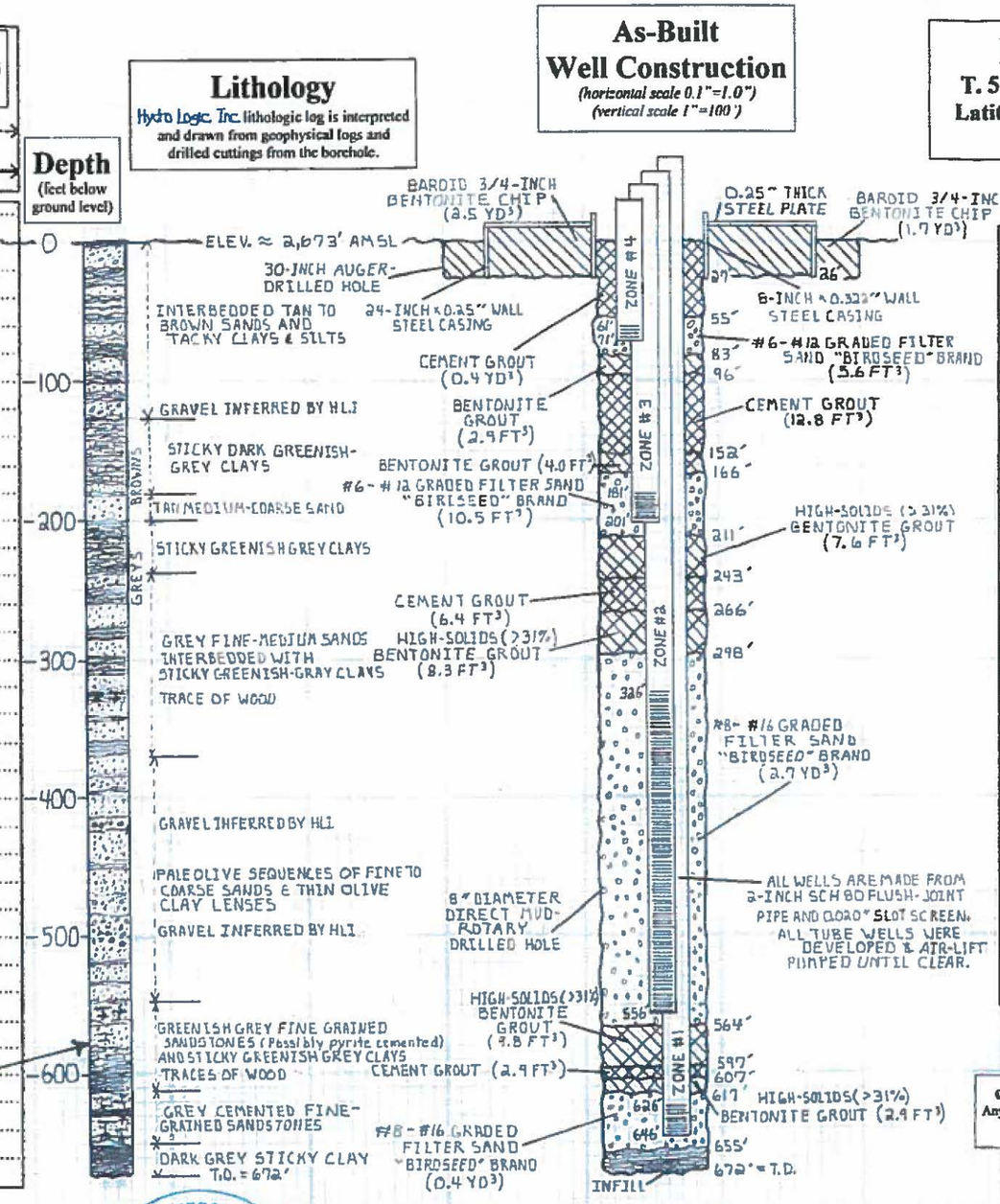
Figure 6.

M3 Eagle - Test Well #4

T. 5 N., R. 1 W., Section 27, NW¼, SE¼, NE¼
Latitude 43° 44' 48.7" Longitude 116° 26' 14.6"
Well completed February 2008





NOTES: ALL GROUTS PUMPED FROM THE BOTTOM UP THROUGH TREMIE AND TAGGED INTO PLACE.
ALL BENTONITE GROUTS CONTAIN GREATER THAN 31% SOLIDS BY WEIGHT.
ALL CEMENT GROUTS WERE MADE WITH 6 GALLONS OF WATER MIXED WITH 94 POUNDS OF PORTLAND CEMENT.

Ground Water Chemistry

Analysis (in mg/L unless noted)	ZONE #1 (646 - 626 ft bgl)	ZONE #2 (556 - 326 ft bgl)
Alkalinity	128.0	122.0
Ammonia as N	0.11	<0.01
Arsenic	0.0029	0.0066
Calcium as $CaCO_3$	83.9	81.0
Chloride	4.13	4.57
Color (apparent)	<1	<1
Conductivity (µS)	307.0	300.0
Corrosivity	-0.45	-0.46
Fluoride	0.48	0.43
Hardness	118.0	109.0
Iron (total)	0.31	0.02
Iron (dissolved)	0.27	0.01
Magnesium	8.33	6.81
Manganese (dissolved)	0.07	0.01
Nitrate as N	<0.10	0.39
Nitrite as N	<0.01	<0.01
Odor	<1	<1
Orthophosphate	0.104	0.133
pH - Lab (S.U.)	7.45	7.52
Potassium	2.52	2.28
Silica	37.2	32.5
Sodium	24.0	25.8
Sulfate	21.2	23.0
Sulfide	<0.05	<0.05
Total Dissolved Solids	225.0	223.0
Total Kjeldahl Nitrogen	0.11	<0.10
Total Organic Carbon	<1.0	1.00
Field Conductivity (µS)	316 to 333	303 to 334
Field Dissolved Oxygen	0.09	2.26
Field O.R.P. (mV)	-122 to -105	+99 to +116
Field pH (S.U.)	7.48 to 7.64	7.53 to 7.70
Field Temperature (°F)	68.9	64.6

Water samples and field parameters collected on April 3, 2008 by Hydro Logic, Inc.
Each field parameter (except DO) was acquired with two separate calibrated meters to validate measurements.
Analyses by Alchem Laboratories, Inc., Boise, ID

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Water Levels

(feet below measure point = 3.5 feet above ground)

Date / Time (24-hr clock)	ZONE #1 (646 - 626 ft bgl)	ZONE #2 (556 - 326 ft bgl)	ZONE #3 (201 - 181 ft bgl)	ZONE #4 (61 - 71 ft bgl)
3/07/08 18:31	130.25	130.72	134.76	unsaturated zone (installed to confirm vadose zone)
3/14/08 17:12	130.25	130.73	134.20	
3/20/08 12:27	130.32	130.79	134.49	
3/22/08 18:12	130.43	130.92	134.74	
3/31/08 14:51	130.11	130.60	134.56	

Water levels recorde

On site supervision, well design, pump test design, and water quality sampling by Hydro Logic, Inc., Boise, ID.
Direct mud-rotary drilling and well construction by Treasure Valley Drilling and Pump, Inc., Weiser, ID
Well development by McLeran Well Drilling, LLC, Fruitland, ID

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668
STATE OF IDAHO

drafted March 2008 by Loren Pearson

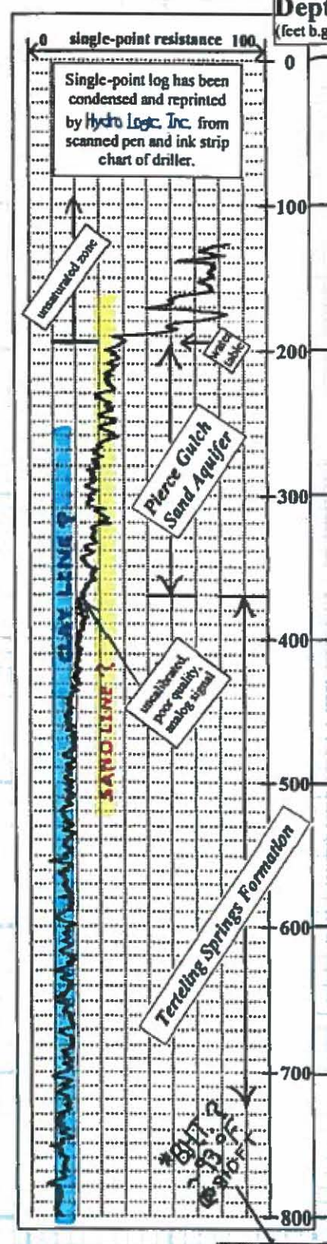
Figure 7.

M3 Eagle - S.V.R. Well #9

T.5.N R.1E. Section 19, SW¼, NE¼
Latitude N43° 45' 33.3" Longitude W116° 22' 52.1"
Completed June 2004

Geophysical Log

(June 2004)
by Stevens and Sons Drilling in a mud-filled borehole.

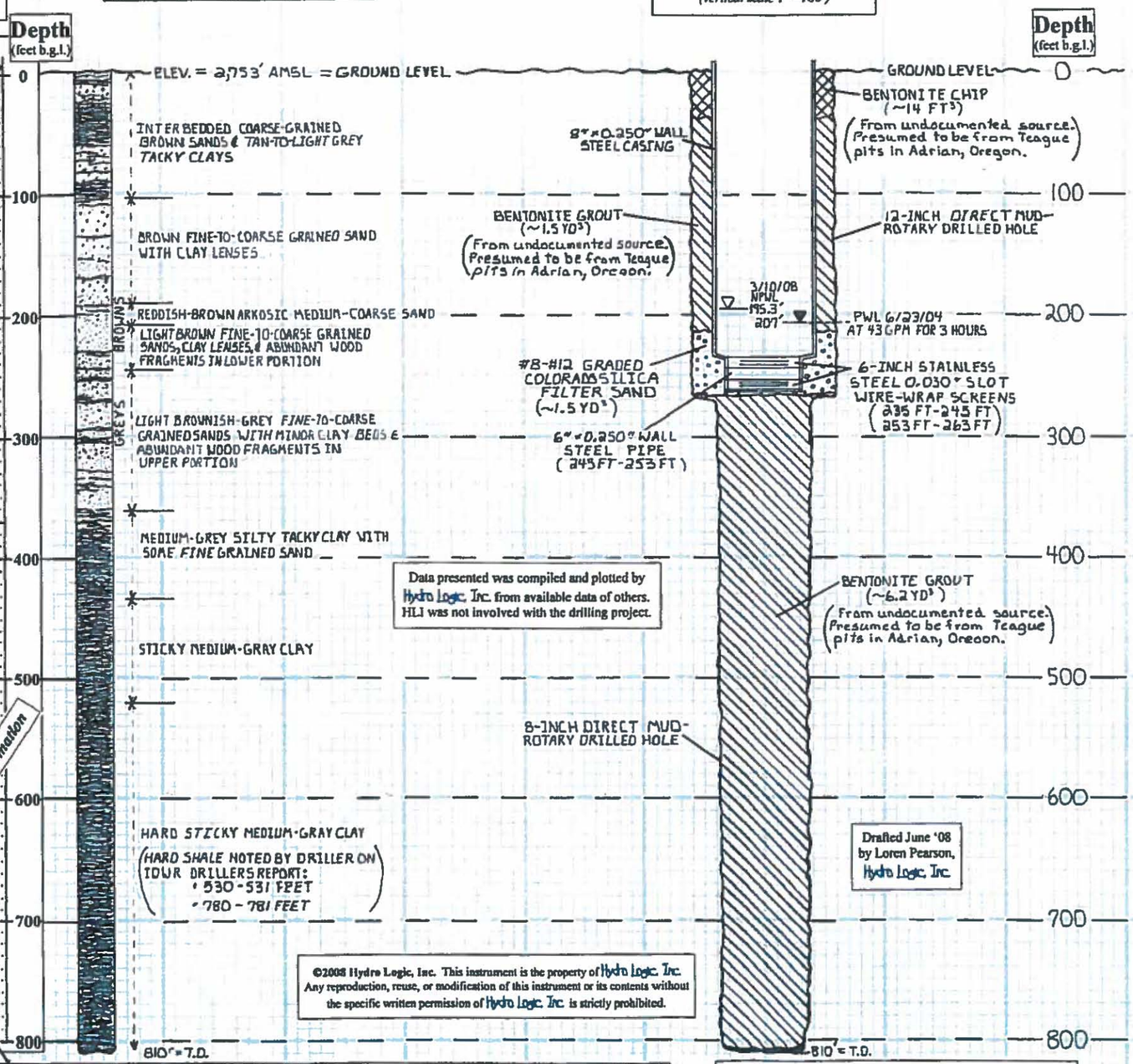


Lithology

Feast Geosciences lithologic log was developed from drilled cuttings. Lithology has been reinterpreted and readjusted below 120 feet to better fit with HLI's interpretation of the geology and the geophysical log.

As-Built Well Construction

(horizontal scale 0.1"=1.0")
(vertical scale 1"=100')



Data presented was compiled and plotted by Hydro Logic, Inc. from available data of others. HLI was not involved with the drilling project.

Drafted June '08 by Loren Pearson, Hydro Logic, Inc.

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* SPF report of 10-13-2004 states:
"The driller measured the bottom-hole temperature (at 810 feet below ground surface) by running a bit to the bottom of the borehole, then pulling up and measuring the temperature of a chunk of clay attached to the bit. He recorded a temperature of 93°F in the clay. The actual temperature of the clay is probably higher (but cooled as the bit was retracted to ground surface)."

On site supervision and well design by:
SPF Water Engineering and Feast Geosciences, LLC, Boise, ID.
Direct mud-rotary drilling and well construction by:
Stevens and Son Drilling Co., Nampa, ID

REGISTERED PROFESSIONAL GEOLOGIST
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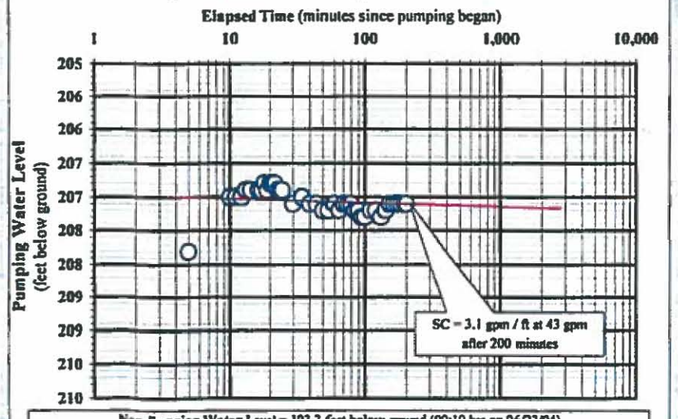
968
STATE OF IDAHO

Ground Water Chemistry

Lab Analyses (note: all samples with 0.45µm filter prior to analysis except sulfide)	SPF Water Engineering Results (in mg/L unless noted) SCREENED (235 - 263 feet bgl)
Ammonia as N	0.10
Antimony	<0.005
Arsenic	<0.005
Barium	0.10
Beryllium	<0.0005
Bicarbonate	107
Cadmium	<0.0005
Calcium as $CaCO_3$	24.9
Chloride	10
Chromium	<0.002
Conductivity (µS)	336
Fluoride	0.45
Hardness	102
Iron (dissolved)	0.60
Magnesium	10.4
Manganese	0.12
Mercury	<0.0002
Nickel	<0.02
Nitrate as N	<0.2
Nitrite as N	<0.01
pH (S.U.)	2.5
Potassium	2.0
Selenium	<0.005
Sodium	26.9
Sulfate	44
Sulfide (*unfiltered*)	<0.05
Thallium	<0.002
Total Dissolved Solids	216
Field Analyses	
Field Temperature (°F)	68

SPF samples collected on June 23, 2004 by Feast Geosciences.
Analyses by Analytical Laboratories, Boise, ID

Hydraulic Testing - (June 23, 2004)



Non-Pumping Water Level = 193.3 feet below ground (09:10 hrs on 06/23/04)
Test conducted by Feast Geosciences and Stevens and Son Drilling Co.
Well was developed by pumping and surging according to SPF report.
Plotted by Hydro Logic, Inc.

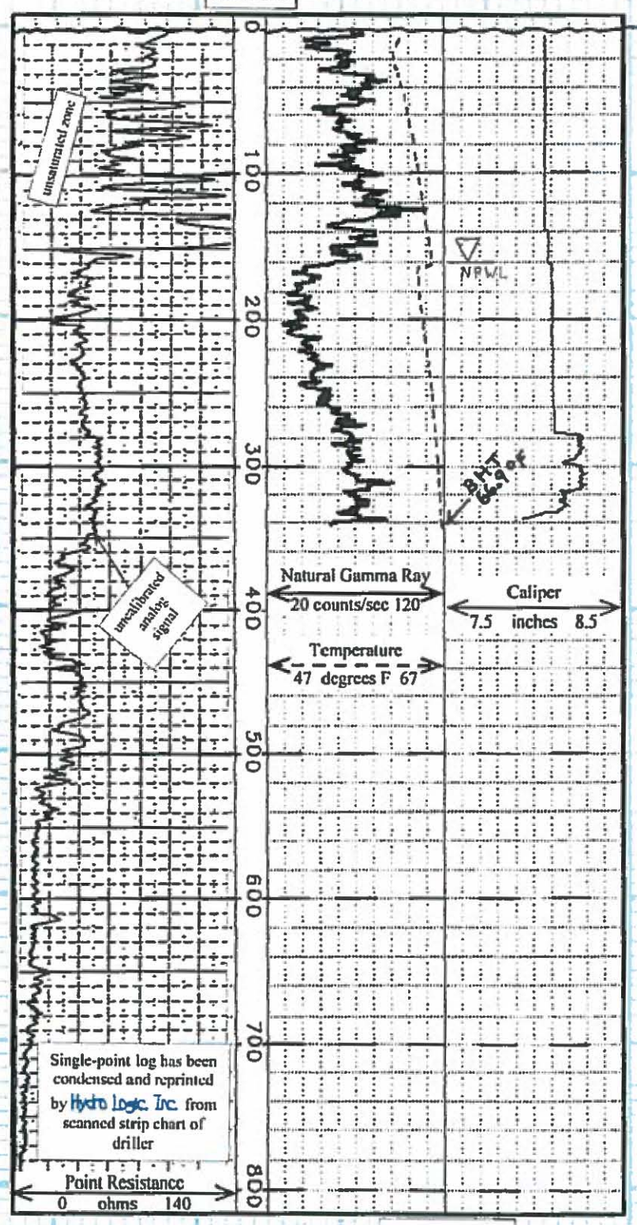
Figure 8.

M3 Eagle - S.V.R Well #7

T5N R1W Section 23, NE¼, SW¼
Latitude 43° 45' 18.9" Longitude 116° 25' 29.7"
Completed April 2004

Geophysical Log
(March 2004)
by Stevens and Sons Drilling
in a mud-filled borehole.

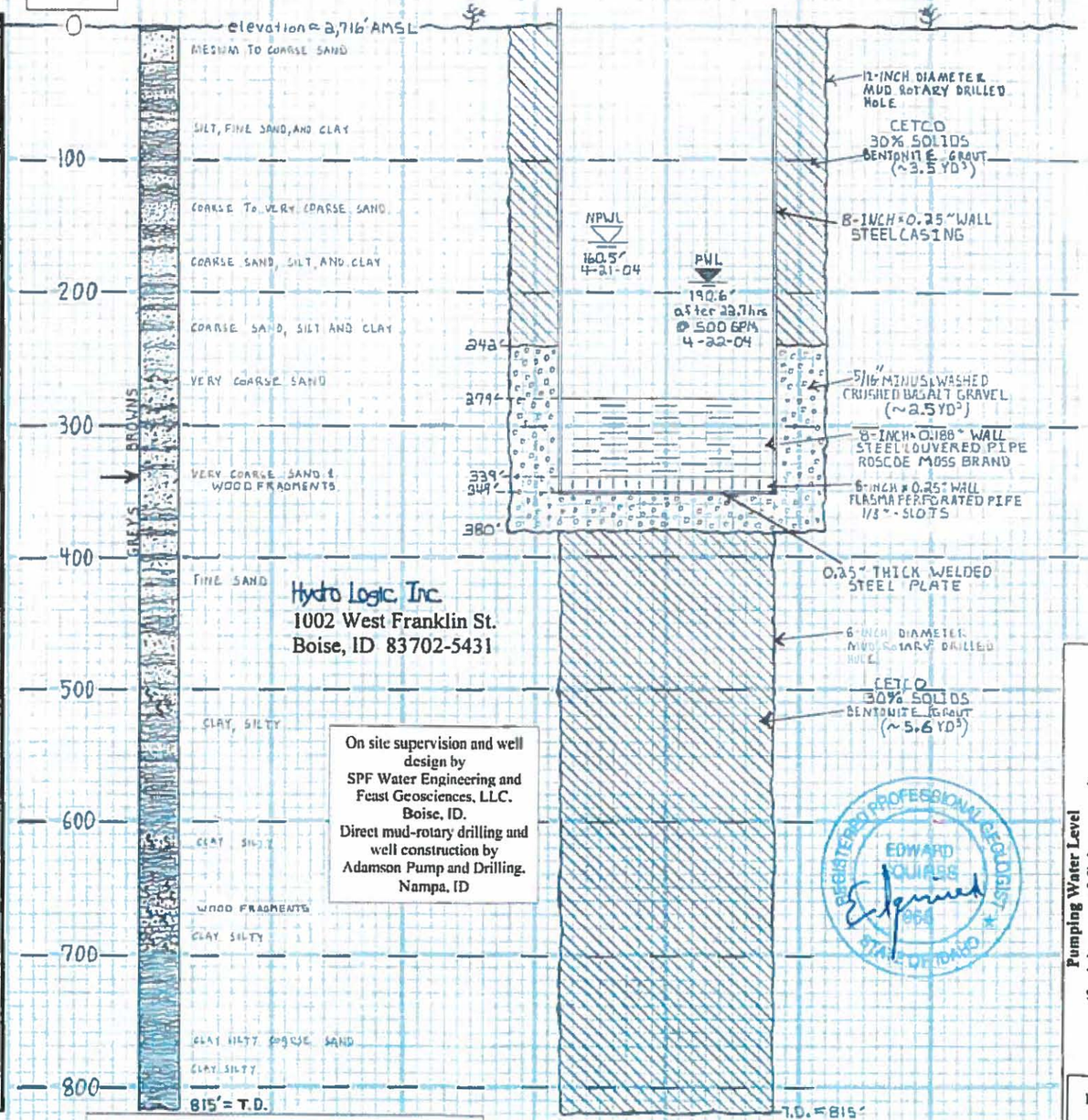
Geophysical Logs
(April 27, 2007)
by Hydro Logic, Inc.
in a steel cased well.



Drafted 02-15-08
by Loren Pearson,
Hydro Logic, Inc.

Lithology
Feast Geosciences lithologic log was developed from drilled cuttings. Lithology has been reinterpreted and readjusted to better fit with geophysical logs by Hydro Logic, Inc.

As-Built Well Construction
(from IDWR Driller's Report and Hydro Logic, Inc. downhole camera survey conducted on August 28, 2007)
(horizontal scale 0.1"=0.5")
(vertical scale 1"=100')



Hydro Logic, Inc.
1002 West Franklin St.
Boise, ID 83702-5431

On site supervision and well design by
SPF Water Engineering and
Feast Geosciences, LLC.
Boise, ID.
Direct mud-rotary drilling and well construction by
Adamson Pump and Drilling.
Nampa, ID

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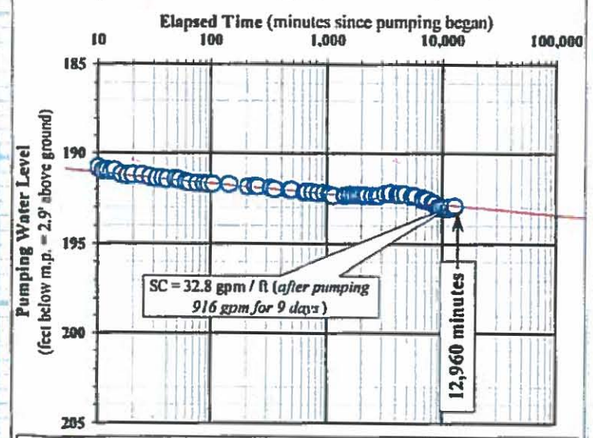
Ground Water Chemistry

Lab Analyses	SPF Water Engineering Results (in mg/L unless noted)	Hydro Logic, Inc. Results (in mg/L unless noted)
	SCREENED (279 - 349 feet bgl)	SCREENED (279 - 349 feet bgl)
Alkalinity		120.0
Ammonia as N	<0.04	0.02
Arsenic	<0.005	0.0037
Calcium as $CaCO_3$	29.1	77.8
Chloride	5	4.42
Conductivity (uS)		305.0
Corrosivity		-0.35
Fluoride	0.44	0.43
Hardness	110	115.0
Iron (dissolved)		0.11
Iron (total)	0.11	0.11
Magnesium	8.19	8.91
Manganese	<0.05	0.02
Nitrate as N	0.31	0.34
Nitrite as N	<0.01	<0.01
Odor		<1
pH		7.63
Potassium	2.0	2.60
Silica		38.9
Sodium	22.9	23.2
Sulfate	24	23.5
Sulfide	<0.05	<0.05
Total Dissolved Solids	212	235.0
Total Kjeldahl Nitrogen		<0.10
Total Organic Carbon		3.36
Field Analyses		
Field Conductivity (uS)	300	382
Field Dissolved Oxygen		+1.37
Field Odor (describe)		minor H-S
Field O.R.P. (mV)		+55
Field pH (S.U.)	7.00	7.40
Field Temperature (F)	68.1	67.0
Field Visible Gas (yes or no)		yes

HLI samples collected on March 14, 2008 by Hydro Logic, Inc.
Analyses by Alchem Laboratories, Boise, ID
SPF samples collected on April 21, 2004 by Feast Geosciences.
Analyses by Analytical Laboratories, Boise, ID

Hydraulic Testing - (March 10-19, 2008)



Non-Pumping Water Level = 165.00 feet below m.p. (16:00 hrs on 03/10/2008)
Testing conducted by Hydro Logic, Inc. and McLeran Well Drilling, LLC.
(no barometric or antec[illegible] d to this plot.)

Figure 9.