LONG VALLEY
HYDROLOGIC ADVISORY COMMITTEE

DRAFT MINUTES
August 1, 2018

PUBLIC MEETING ATTENDEES

Ormat: Janice Lopeman, Mark Hanneman, Cheryl Eanes, Steve Henricksen
USGS: Jim Howle, Bill Evans, Eric Reichard
BLM: Mark Spendel, Steve Nelson
DOGGR: Charlene Wardlow, Jack Truschel, Jack Collender, Carolyn Cantwell, Jerry Salera, Olu Oladimeji, Colin Lawson, Callie L. Cullum, B.G. Rackett, Amar Rao, Curtis Welty, Scott McGurck
CA Energy Commission: Elisabeth de Jong
CSLC: Noel Saito
EGS Inc: Gene Suemnicht
USFS: Colleen Garcia,
Great Basin Unified Air Pollution Control District: Grace Holder, Jan Sudomier
Lahontan RWQCB: Tom Browne
MCWD: Pat Hayes, John Pedersen, Irene Yamashita, Tom Cage, Mike Blazevic (Wildermuth Environmental, consultant)
Mono County: Nick Criss & CD Ritter
Guests: Mike Bodine, The Sheet; Malcolm Clark & Lynn Boulton, Sierra Club; Lynn Boulton, Range of Light Group; Dave Harvey, Southern Mono Historical Society; ~~Mike Blazenz~~, ~~Wildermuth Environmental~~

1. **Call to order & introductions:** Nick Criss called the meeting to order at 10:10 a.m. in Town/County Conference Room at Minaret Village Mall, Mammoth Lakes. Attendees introduced themselves and their agencies

2. **Public comment:** No items

3. **Review/approve minutes of February 7, 2018 :** Adopted as submitted.

4. Subcommittee status reports: G3 down for month, flow tests results, finishing up a report for the CA Energy Commission.

5. **USGS monitoring data (Basalt Canyon temperature logs:** 14A-25 steady water level decline. Dual piezometer well. August 2016 lost hose down well, retrieved 12.17, airlifted shallow well for a day. Data stream begins just before 2018. Upward trend in water level since April 2017. Well 28A-25, south Shady Rest Park, shallow and deep water wells hundredths of foot apart. 14A steady recovery rate, 28A got good kick, but continues to decline. Across from USFS vis ctr new well, BLM-1. Deep and shallow track well. 28-25 pulled valve off top. Large water level rise. Kill slug led to 50' lower, cold water not equilibrated. Took week to equilibrate. Water level dropped in June 2018 before things flattened out.

Lopeman: Rotated master valve for proper fit, pumped cold fluid to ensure no well blowout
Howle: 14A-25 temperature profiles Aug 2017 to May 2018 stable, not much change.
Lopeman: Both dual completions? Howle: No, std is usually deep well.
Howle: 28A-25 drilled, muds injected from 300' and deeper, cooling response. In May 2018 temperature moved back to pre-temperature profile. Biggest change 0.4 degree C. New BLM-1 monitoring well January 2018 to May 2018. Big temperature reversal indicates hydraulic

conductivity. Fluid flow strips heat out of formation. 28-25 next to 28A, two logs, static level ~500', reversal in zone of high permeability. Water temperature at 1397 = 190 C. Well CH-10B saw response to large 16-17 winter.

Well LV 19 shallow cold-water monitoring well, large 16-17 response. Temperature still climbing mid-July 2018.

SC-1 & SC-1 by Sherwin Creek campground. Modest recovery this year. 2017 response much less. Plateaued out. Highest level recorded back in 1980s.

Browne: Shallow based on MCWD draw? No, drilled based on geophysical logs.

Howle: 28A-25 shallow dual completion. Deep = 575'-595'.

Evans: results of nighttime thermal IR flight interpreted into paper at Oct geothermal resources council in Reno. Very high precision of temperature and location geothermal pipeline from well 57-25. Discovered new sites of anomalous thermal. Cl monitored in several MCWD production wells, decline at P17 (has geothermal characteristics). Decline steepened in last few rounds. Increased recharge of non-thermal component. Cl up sharply in dry winter. Many wells have small component of geothermal chloride elevation, but none show decline like P17. Boron/chloride ratio study. All geothermal sites across valley = 23. Westernmost well has highest chloride. Geothermal mixing line clusters at origin where MCWD has wells.??? Ski area applies salt on slopes 100k-200k/yr.

14A-25. Lithium/chloride sometimes used. Br/Cl also. Tells missing of geothermal water. Three production wells plot near Mtn water. New BLM-1 plot in cluster of other monitoring wells.

Browne: Meteoric water line? Yes. Geothermal water follow different line.

Evans: Isotopes of BLM-1 better match to wells.???

Pedersen: Southwest rim? Evans: Not a lot of data points.

Lopeman: Few wells in center have different recharge coming off Mtn.

Evans: High country off to north is isotopically lighter as well, so not specify where recharge is. Somewhere slightly to east. Points plotting farthest out have oxygen shift. Assume effect of steam loss is small. Oxygen shift affects deep-water reservoir.

Hanneman: Wells cluster together. ??? Isotopes in Schmidt map make sense.

6. **USGS water chemistry of MCWD wells and new Basalt Canyon monitoring wells.** Nothing to add???

7. **RV Park monitoring well:** Nothing to add.

8. **CD IV Groundwater Monitoring & Response Plan (GMRP):**

9. **Wildermuth Environmental report on water chemistry of MCWD wells and new Basalt Canyon monitoring wells:** Pat Hayes introduced Mike Blazevic~~nz~~ for presentation. In March produced water quality report. Data for western portion of caldera before and after CD-IV project in 2014. Focused on prior data. Shallow aquifer completely separated. Second: Data by USGS collected later regarding separation. USGS collected samples quarterly. Basalt Canyon data is proprietary.

Charts and figures show data trends and relationships. Showed location map of Mammoth groundwater basin.

Data prior to~~p~~ 2014 had physical parameters, isotope work, no multi-year analysis to assess data trends. Data after 2014 had USGS consistently sampling for multi-year analysis.

Why sampling not done before by MCWD? Pedersen: General mineral required by State. Chloride samples not done quarterly. When saw conclusions in EIR/EIS, MCWD stepped up to pay for consistent sampling. What is seen here is MCWD.

Blazevic~~nz~~: Boron not required for MCWD. Concern that some wells showed elevated temperatures. Consistent warmth may mean communication between systems. Elevated physical

parameters, looked at concentration ratios. Sample prior to 2014, no USGS. P18 not part of geothermal sampling set.

Pedersen: Not produced during drought. Temperature data on 18, on Old Mammoth Road, not particularly warm, more similar to 6 and 10.???

Blazevicnz: Boron v. chloride developed mixing line. Small thermal component in P17, ~4%.

Browne: Changes in pumping rates?

Pedersen: Yes, pumped production wells more during drought when surface water was not available.

Hanneman: One sample in 2011 when well not pumped compared to 2016.

Pedersen: Record of pumping vs. not pumping.

Hanneman: two heavy winters.

Pedersen: Mixing in every one of years.

Hayes: Ormat contends USGS data can be interpreted in diff ways. 2011 wet year discounted as potentially anomalous. Collected since 2015 shows consistent mixing in well 17.

Lopeman: MCWD well grouped together?

Blazevicnz: Nonthermal waters close to zero. Conclusions: Prior to July 2014 may not be valid. Post-2013 data not support separation.

??? Seems clear only change was weather and pumping rates.

Hayes: Env docs say no need for concern by MCWD because cuz two separate systems separated by impermeable barrier. Data shows mixing going on, diff from env doc says none. Well 17 provided 20%-25% water water supply in 2011. Treat by dilution and removal of As. Small percent increase could knock well off line.

Hanneman: Source of geothermal system? How connect anything Ormat does? Can't assume pumping rates, drawdown have connection to geothermal system. Report implies Ormat is affecting wells.

Lopeman: Startup of 1200 gpm.

Blazevicnz: CD-IV proposal is different from flow test. Don't know ramifications of full production.

Hanneman: Production causing gases to move up hundreds of thousands is crazy talk. Evidence MCWD wells.

Lopeman: Wells to east are dry and impermeable.

???: Can't identify where fluids come from but think will affect.

Blazevicnz: Small percentage decrease in P17 could have effect, so safeguard the town.

Lopeman: Detect changes in pressure, temperature, chemistry in Basalt Canyon. If produce more fluids, monitor how far out would affect Ormat and MCWD wells. Change in water level detrimental to Ormat as well. Monitoring wells saw only minor response. 14A-25 not that far from RDO-8. Proved why additional wells drilled to west. Higher temperatures not surprising within known thermal area. Thermal water separated and down-gradient from MCWD wells.

Evans: Continue to adjust models. Each measurement of pressure record gives new information on hydrologic flow and connectivity.

Spendel: Flow tests, stress tests are on BLM radar.

Lopeman: Ormat's starting point. Updated geologic reservoir model good control factor.

Evans: Howle did work, not Evans.

Nelson: Encouraged by change in data richness. Better served by more data. Headed in right direction. Did Blazevicnz see something else to add to monitoring? Missing anything?

Charlene Wardlow was at Ormat 2006-16, since worked with DOGGR, especially Jack Truschel. Presented large sheet cake to recognize his 12-year contributions to Long Valley HAC.

10. **Adjourn** at 11:42 a.m. to next meeting: February 6, 2019

Prepared by CD Ritter, LVHAC secretary