

LONG VALLEY HYDROLOGIC ADVISORY COMMITTEE

DRAFT MEETING NOTES

February 10, 2016

THERMAL SUBCOMMITTEE ATTENDEES

Ormat: Charlene Wardlow & Assaf Weinberg. **USGS:** Jim Howle. **BLM:** Mike Lystad & Collin Reinhardt. **EGS:** Gene Suemnicht. **Mono County:** Nick Criss & CD Ritter

PUBLIC MEETING ATTENDEES

Ormat: Charlene Wardlow, Cheryl Eanes & Assaf Weinberg. **USGS:** Jim Howle. **BLM:** Mike Lystad & Collin Reinhardt. **EGS:** Gene Suemnicht. **MCWD:** John Pedersen, Forrest Cross & Irene Yamashita. **CA Mono County:** Nick Criss, Brent Calloway & CD Ritter. **Public:** John Walters, Malcolm Clark, Dave Harvey, Dan Lyster.

1. **Call to order:** Nick Criss called the meeting to order at 10:03 a.m. in Town/County Conference Room at Minaret Village Mall, Mammoth Lakes.

2. **Public comment**

None

3. **Meeting notes of Aug. 5, 2015**

Bill Evans sent a note on the chemistry discussion: Add “applies salt with high chloride and bromide.”
Howle: H23 spring group used for brood stock area at Fish Hatchery. (OK as is). Temp = 19° C

MOTION: Approve minutes of Aug. 5, 2015

4. **Subcommittee status report**

Improve data collection on well 12-25.

5. **USGS monitoring data: Howle**

Precipitation: Three months where the recorded precipitation was greater than the long-term mean, no drought buster. All going down. Need major-league winters for recovery. 22.4” mean from 1982. Major hit, not close to recovering. Well CH-10B has less seasonal fluctuation, but is at historic lows. Wells at airport and Sherwin Creek down. Rate of decline in deep (SC-2), confined aquifer is steeper, alarming acceleration downward.

Fish Hatchery Springs: Record low discharge since 2013. Hatchery 23 more steady state source area. Since inception AB and CD had constant offset in change, but since 2013 fundamental change in temps. AB now cooling, CD warming. Clear trend evident. Total discharge of AB and CD, calculated thermal water discharge: from 2013 sharp decline, thermal component dropping off.

Pedersen: CD warmer, maybe thermal discharge declining in AB?

Howle: AB seems to be climbing, but temp falling off (counter-intuitive). Can't second-guess individual samples. Thermal water discharge in cfs increasing.

Hot Creek: Flume discharge at all-time record low, people soaking in 100° F temp. Showed long-term plot.

Shady Rest Park: Drilled 14-25A and 28-25A. USGS used drill bit with notch that catches lip to drill 9” hole. High-pressure air mixed with water. Technique drilled to ~340’ in both wells, transitioned to typical air-hammer bit. Well completion diagram of 14-25A, two zones deepest at 595-575, sand pack. Bentonite seals involved. Termination of where to complete based on geophysics, notably sonic logs (acoustic).

Sound waves sent out into formation; return takes longer if rock is fractured. Resistivity logs: two probes different distances apart. In fracture zones, see excursions between 16" and 64" resistivity. Highest temp is at bottom of 14-25A hole.

Well 28-25A: 10-ft thick bentonite seal, calculated volume to where next seal was proposed. After filled volume, found what should have filled entire bore had accumulated only 12' of grout. Formation highly fractured, shown in sonic logs. Mixed whole new batch with Ba rock chips into mud to fill and seal well bore. Picked next open zone to get hydraulic communication as deep as possible, ~450'. Starting at bottom fill each interval with sand, see where top is. Pulled out casing incrementally so not to cave back in on hole as completed. In November monitored continuous water level, hydraulic pressure. Temps cool enough for submersible transducers 15 psi range. Subterranean vault for barometer to tell if confined or unconfined aquifer.

Well 14-25A: Site so warm could not use submersible transducers. Up-hole transducer, nitrogen gas forced through continuous-flow site feed at constant rate. As water level goes up, back pressure increases. Monitor pressure change in aquifer. Great instrumentation. Pressure transducers collect data. Collect temp profiles in all wells. High-resolution platinum rod, repeatable to 0.1 degree C. Connected to data logger, manual depth counter. Temp logs of 14-25A in September and early November. Cooler fluid around casing makes inflection point in temp profile. Anticipated frictional heat of drilling. Two more logs by next meeting to see if wells have equilibrated.

Well 28-25A: Conducted temp log in deep piezometer. Shallow and deep logs identical for two wells. Early indications of identical profiles. Upper level kink unexplained. In cooler zone temp increased 0.2 C degree.

Well 14-25A early data: Barometric pressure in millibars. Strong inverse relationship between pressure and water-level change. Shows confined aquifer. Primary tool for deep confined v. shallow unconfined. Difference only about a foot. When pressure low, water level in shallow seems to flatten out. Leaky, not real tight confining unit, so hydraulic communication occurs between completed zones. Downward movement of water.

Well 28-25A: Has two confined zones, may be single. Complex geology in area. Similar elevations, but half mile away have two confined aquifers. Some geologic barrier allows confined response. Upward gradient at site. Two wells similar in depth. Highly fractured, monitoring at two levels, but same hydraulic head. If drill other holes with mud rotary, starting to lose circulation might confirm this.

Showed site IDs to webpage data. 10-minute data transmission by satellite.

Sent 02.11.16: The link below will take you to the NWIS website for ground water sites. Scroll down to Mono County. Four wells are listed: 373904118570701 and -02 are the 14-25A wells, and 373927118571701 and -02 are the 28-25A wells. Click on the site number you want for the page with available parameters, available period, output format, and date options shown at meeting. Currently, only 28-25A is transmitting near real time. Until some trees are removed at 14-25A, you will see data only up to my last visit there. Data downloaded from this site are provisional and subject to change. Data since my last visit *will* change. When I visit the sites again, I will make a calibration measurement and apply that calibration to the intervening period. Use with caution. <http://nwis.waterdata.usgs.gov/ca/nwis/current/?type=gw>

Thanks to Ormat, new compressor, pump and tubing equipment to sample the wells for water chemistry (individual covers to be ordered). Lab in Denver takes six to eight weeks. Discuss new rounds at August meeting. February-April data available by August meeting.

Wardlow: Pay to expedite turnaround? Howle: No. Time-dependent parameters in samples. Boron notoriously slow, so wait for batch to run. At mercy of lab. Send to Bill Evans at Menlo Park, maybe quicker on Ca, Na, Mg data.

Wardlow: USFS helped outline details in plowing to access site.

6. Review of monitoring of May 2015 Basalt Canyon geothermal production shutdown

Pedersen: Missed August meeting, little discussion then.

Wardlow connected by phone to Assaf Weinberg from Imperial County. Went through each well from top line to bottom. Mammoth Pacific Observation Wells Pressure Response. *Phone issues, couldn't hear him, so Wardlow talked.*

Basalt Canyon outage on Memorial Day 2015 data reviewed by Ormat. Wardlow interpreted multiple colored lines on graph. The wells responded as they should, pressure decline in well monitoring injection due to reduced injection flow and pressures increasing in Basalt Canyon due to shut-in wells. Data is logged every hour and manually downloaded. Some wells will be getting new data loggers before the 30-day flow test. Casa Diablo increased some production during shutdown to make up for the loss of flow from Basalt Canyon wells

Pedersen: Look at MCWD data? Learned about monitoring groundwater production wells. As much as try to keep steady production, maybe other wells as options. Change or improve data collection with Ormat and MCWD. Transducer at M26? Pressure steadily declined, no significant change in temperature. Focus more on monitoring wells. Shut down total flow. After decent winter, supply town surface water in springtime.

Wardlow: Aiming to start the 30-day flow test June 1 but lots to prepare. Pedersen: If snow is on ground in June, not as much irrigation. Wardlow suggested late June for field trip.

7. Updates on new monitoring wells

Covered in item 5.

8. Update on MCWD and Ormat meetings

Reinhardt: Held four facilitated meetings on shallow groundwater monitoring. Plenty of progress, commitments by both on financial aspects. Looking toward draft by end of March. BLM will review, USGS will help. Moving in positive direction.

Pedersen: MCWD will look at draft.

Reinhardt: Steve Nelson at BLM is not imposing deadline, but Ormat might.

9. Update on CD IV

Wardlow: Identify first production wells to drill, grading plans so ready to drill 2017. Well pads maybe late summer, early fall. Maybe pipeline to 14-25 for longer flow test this summer.

Reinhardt: No applications for permits on drill pads or pipeline. Talking to Ormat. BLM can stress Basalt Canyon. See how 14-25 reservoir responds under more pressure. CD IV EIS has mitigation requirements, such as shallow groundwater monitoring plan. No Ormat timeline earlier, but now two-year construction window. Aggressive timeline.

10. Next meeting

Aug. 10, 2016: Public meeting at 10 a.m.

Prepared by CD Ritter, LVHAC secretary