Raft River Meeting 17 Aug 79

Sue Watson Les Smith

Japanese visitors - people from 5 mfg or assoc in Japan + all equip. manufacturers

Two Groups here today:

Case Study Advisory Group - purpose to see if all has been done before field goes into production.

One more major meeting around first of year, at which time hope for draft of case study.

when prod starts, a second advisory group, smaller, lead a/ resource.

Movie: 1974 appl began; 1975 drilling:

- first well 4500', 150°C ≅ 300°F
- cement-asbestos pipe w/ spray-on polyurethane 2°F/mile loss.
- crops grown w/ gt water - extended growing season, no chem effects
- soil warming apparent - grow trees
- fish growing, disease lower

Dick - alcohol plant is going in to take advantage of fall crops

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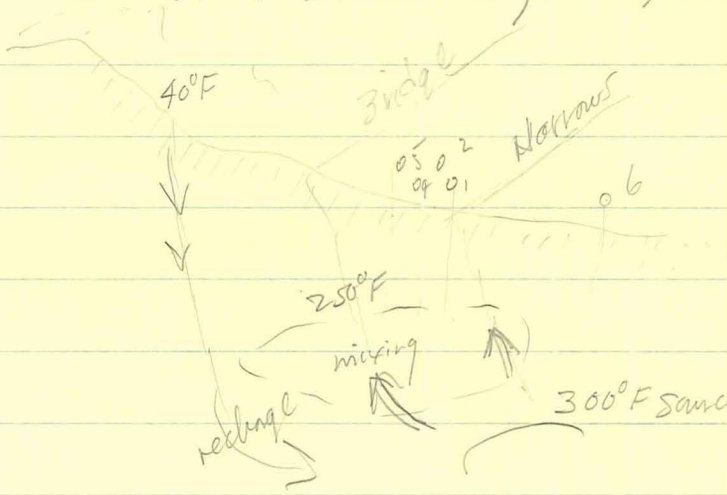
should we do soil geochem survey here ??

Dennis Goldman –

- RRGE-1 sits right outside bldgs on site. –
- RRGE-3 – 3 legs from bottom below ~4000' increased prod. (90 gpm) by 700% – 50 legs ~ 2000'. & up to 15°. Bottom Spread ~300' apart

Segment ↓

- No extensive tests bec could not pump high rates (environ probs)
- RRGP-4 – was drilled for an injection well.
- RRGP-5 – drill probs., well killed w/ salt got in trouble w/ state
- RRGP-6,7 next for injection wells
- Then rig went back to 5
- Then rig deepened 4
- Goodwin model -- early model, still thought to be current.



Basin full of Salt Lake Fm, which sits on pre-€. Contact is producing zone. Contact fractured, in some places sealed by ppt deposition. SL Fm

- use of temp logs after producing & injecting, shows zones of production. Spinner tools don't work (heat). In RRGE-2, Three main zones of production.
- well testing. - get temp. effects on well-head pressure graphs
  plot well-head pres vs log time (minutes)
  They use DP tool to get ~0.01 psi.
  Prob is of temp changes, instru gives bad data
  * have found that pre-heating wells @ 100gpm for 2 weeks before tests. - This helps -

- Objectives of Res. Eng. Work
  - define hydrologic production & injection characteristics
  - define Natural characteristics of prod. wells
  - define impact of production & injection on overlying groundwaters

- each well has a one-way flapper valve at depth which can be used to shut in artesian flow. To open, run a stinger down. - Flapper seals opened.

- RRGE-2 shows boundaries @ 15 km (50') and 333 km (100') - shown by doubling

RRGE-3 - T = 296°F (Chatfield) and is also geochem. different.
- see a recharge (?) boundary @ 3533 min. -- This may be a hot-water recharge.

RRGP-4
drill rig is sitting on site 4 now. — This well will be stimulated (Republic) —
Bob Nicholson.
only flows 30 gpm prior to tests
- double cgged well
stimulation will be a sand prop. —
This will be first stimulation of a geothermal well

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wells range in cost $1/2-1M each -- drilled by commercial (first 2 gvt ngs) -

RRPE-5 - This is coolest well - located on basis of property, not geology - 272°F
-- 272°F is below what power plant needs -
- probable recharge boundary @ ico; could be cool recharge to give lower temp. —

RRGI-6 (injection) - located to SE to

- all changes in 1000' forming water wells when inject in -6. Thus, it may not be suitable for injection.
- uncased 1698 - 3888.

RRGI-7 - orig. thought to be a poor well, but orig test data were poor.
-- by now (recently) have run new tests which indicate this well is better than at first thought.
Now plan a 1 → 6 & 7 test.

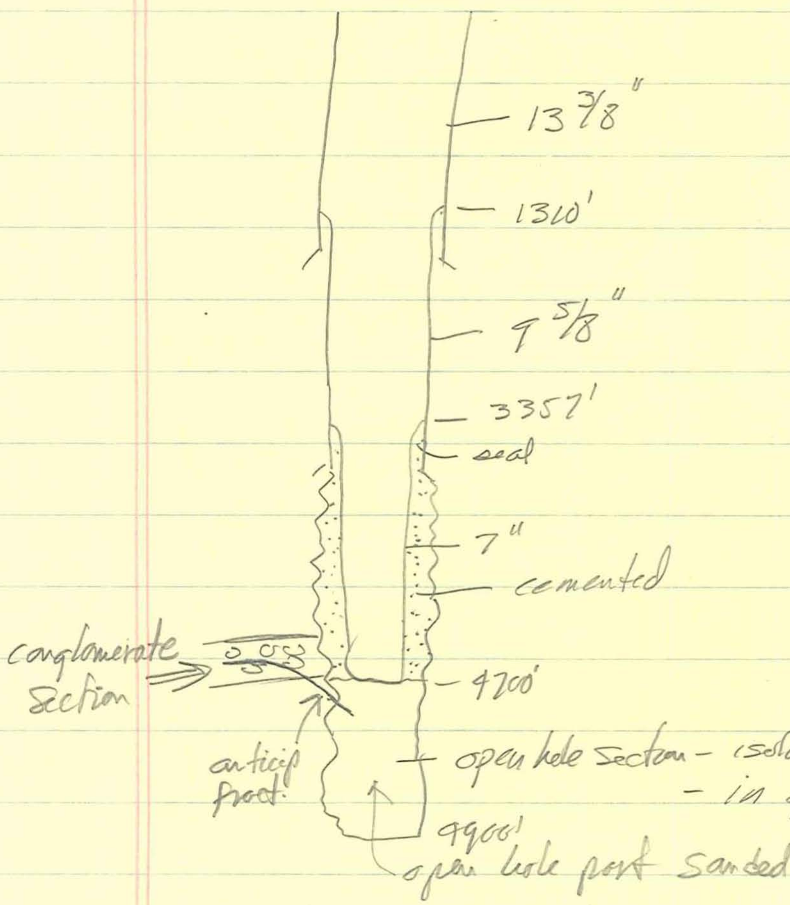
CONCLUSIONS

1. Prod. capacity 2580-3130 gpm (adequate for plant)
2. Inject. capacity not known, may be high
3. Temp Bridge fault syst 270-283°F
Narrows Stmt 296°F
4. Numerous boundary effects; some of which are recharge -
5. Interference between wells - unevaluated
6. Interference observed between -6 and -7 and between -6 and MW-4. (½ mile)
7. interference between prod & keyed wells unknown
8. aquifer system complex

Harry - says that temp logs show that

- correlation between wells in SL fm is not possible due to stratig, struct complexity and hydroth alt.

Bob Nicholson (RGI) - Stimulation of RRGP-4.



pulse duration, interval;
pump 500 bbl
500
2000
5800
12000
} @ w/ diff amts, size sand -
500 bbl - dev water

Technique - (Keel (?) after some guy who holds pat - Pressure cycling. Theory is that each cycle produces fracts ⊥ to last. Fract radius anticip @ 500'.
- Pump up, inject, sand closes at leading edge, bleed back, pump up again and fract takes off in diff direction -- orthogonal (?) - may open up cross cutting fracts 2nd time.

Roy Mink - Action Items

- Lehr - ask some good questions
  a) biggest mistake → well siting → building powerplant b/f resource def
  b) objective this meeting.
  c) what surface techniques used

Roy Mink - Action Items

1. Reflection Survey - # x-fer DOE → USGS is there USGS matched w/ # prev. identified for NEL-1 work (USGS had not budgeted matching funds). So Hans Ackerman is going ahead. Cost ≈ $100-125K. If go over budget, SWSalisbury would kick in.
   - Don M. recom's meeting to pick lines.
2. modeling - Jim Mercer - wants to model, but will be leaving USGS couple months, but will leave project in good hands. Model would be used by ID/EG&G to track field. Jim says model not documented/open field yet -- using a 3D model.

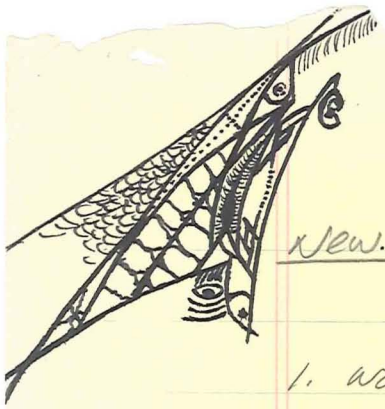
   Bredehoeft says guy who will carry on is green, will need help. They plan to develop and then turn over to EG&G, but not support.

   Ron Shroeder says LBL not doing anything @ RR at present

   Mink says they will get model

main purpose is to study recurrence intervals of faulting by studying differences between up and down side in sediments. want to get down to gravel, then study soil development (expect wind blown loess) to determine # fault movements in last ~ 100 K years.

4. Paleomagnetic Survey/Tool Development - no follow-up at this time
5. Heat Flow - Manny N. will get out report next few months. If people want data, approach thru Duffield because Manny is defensive about giving out data.
6. Core Descriptions - Williams - he has talked w/ PMW -- I promised him core -- will get description in October.
7. Mast Track - it is avail. now, is on site, on loan from Sandia.
8. Test RRGP-4 - Decided not to run short test.
9. Geology Cross-Section - although have had several meetings all says for RGI & Terra Tek. But no "geol closure" meeting. Also looked at cays @ Schulumberger "fracture signature" log. Conclude borehole televiewer better, but Sch. only needs better display to have useful log. Also GO is



New. Action. Items.

1. wants info on by Dec for draft case study. Rept will be updated as we go along.
2. Lays + EG&G are developing a 3D model of system -- location of fracts, etc. -- will work on over next year, etc.
3. Mabey - it is USGS intent to have Dan Williams pull together all USGS - Geol Div work - geophysics ~~may~~ will go in here. Scott Keys is separate point of contact.
4. Goldman - geochemistry -- May say trend in geochem from BLM well to site NW-SE. Also pipeline breaks only occurred along this line.
5. Mink - talked about re-injecting at shallow depth at low pressure in thief zone @ 1-2K ft. It would solve a) power use for high pressure, deep injection, b) would recharge upper aquifers, so State would be in favor.

Shallow irrig wells are 1-400', produce typ 1,200 gpm w/ little 50' drawdown

6. Roy M said he likes my idea of soil geochem to chase the NW linear that appears to exist via water geochem changes. I said should