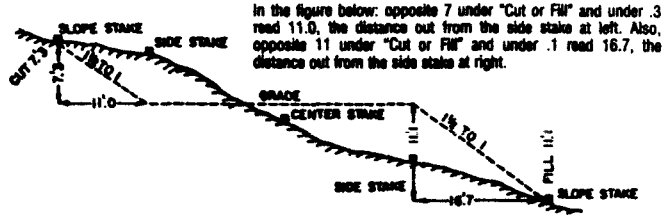
DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

DAP = English penny

"Rite in the Rain"
ALL-WEATHER WRITING PAPER ®

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Project Natural Analogs.
"DAP" = David Pickett
Refer to Project Plan for background.
This notebook covers field work.
Also includes work under Near Field KTI

DAP 2/24/96

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Sep. 17, 1994 Peña Blanca

a.m. - talk by Ignacio Reyes in Chih. hotel.

Stratigraphy:

Mesa - trachyte Widespread
Peña Blanca - ~~volcaniclastic~~ DAP 9/17 (like Escuadra)
Chontes - v-clastic
Escuadra - air fall tuff, ash flows.
Piloncillos - v-clastic
Nopal - ash-flow. Silicified, massive.
Coloradas - devitrified vitrophyre. In Nopal unit.
Corrales - ash-flow
Pozos - limestone ± volc. conglomerate.
Cuervo - ash-flow, folded w/ limestone.

K limestone

Above Cuervo, horiz. or gently tilted.

Ages: Corrales 53.8 Ma
Nopal 44.4 Ma
Escuadra 38.3 Ma
Mesa 37.3 Ma

Nopal Fm" - most U deposits in volcs.
K limestone also has many deposits.

DAP 9/17/94

Nopal I breccia pipe. Most U is in interstices of fragments. Nopal and Colorados units (most in Nopal). Lower down, gets wider, but grade decreases.
U reserves: 116,000 ton with
Avg. grade = 2.83 kg/ton U_3O_8
(upper 55 m)

Other deposits: Puerto 3 Margaritas.
More tabular, stratified than Nopal I.

On-Site Trip with NAWG group.
Margaritas open-pit
Nopal – presentations by EP (English Fancy) and WM (Bill Murphy).

North side of level 0, manganiferous calcite. 'Green & red' phases – what are they? Visit again later.

DAP 9/17/94

18-Sep-94

Photos 5 & 6 Caliche from site collected by Bret Leslie, yielding 54 ky. From mined exposures around corner from South wall of Level 0.

Sample DAP-1 Caliche.
Much thinner layers, about 10 m along wall to north, almost at corner.
≤ 1 meter below old erosion surface (i.e., pre-mining), whereas previous caliche sampled is much thicker and about 2+ m below surface.
Take more photos tomorrow when sun is better.
After writing those notes above, I found it was too difficult/dangerous to try to sample this material.

DAP-2 Caliche, 2 m above southern of two adjacent deposits dated by Bret Leslie. Photo later when sun better.
~10 cm or less below pre-mine surface.
Clasts of tuff embedded in caliche.
Good layering in caliche.

DAP 9/18/94

DAP-3 Caliche in Nopal Fm.

NE of deposit (@ level +10) at "corner" formed by vertical excavated walls and pre-mine surface.

At ~ level +16 m.

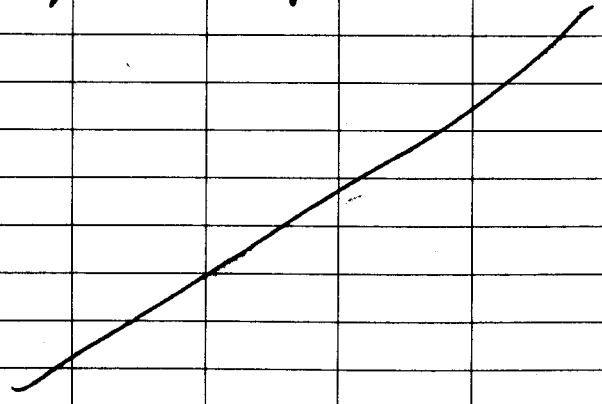
Hard to tell how far below pre-mine surface because of rubble covering the ground.

EP looked up at me from level +10 (SW of me), estimated sample locality at ~ +16, and estimated that I was not very far below surface.

Three pieces of same rock. Purple, porphyritic Nopal tuff.

First layer of coating is black to ~~orange~~ DAP 9/18/94 orange, very fine grained.

Caliche coating on top of black/orange, thrugh in a few places they interlayer.



DAP 9/18/94

19-Sep-94

Until 11:00 am, assisted Ron Green, Ignacio Reyes, and Kristi Meyer with Electromagnetic sounding (hydro).

Then hiked first to +50 m level. Took two photos of +10 m level, with EP and Linda Kovach on it.

Observation: pre-mine surface must have been rather steep. ~~Also took one photo~~ DAP 9/19

Then hiked up road to peak of cuesta, formed by Nopal Fm. (had taken photo of peak and cliffs of Nopal Fm. from level +50 m).

From near peak, took photos 16 + 17 of Nopal I area.

Again noted steep pre-mine surface NE side of mine, slope is entirely rubble, ie, mine debris.

On Nopal I level +10 m: briefly take some readings with survey meter.

Definitely notice increased dose rate when cross into visibly mineralized area.

Holding probe down at arm's length, 1-2 mR/hr in mnl. zone. About 2 cm from U minerals, ~ 10 to 20 mR/hr.

DAP 9/19/94

Rn measurements with Red Elec. "E-PERM" system.

Check voltage reader using calibration standards.
Electret R2018 ± 265 V
Electret R2025 - 259 V
These are each 1V higher than certified values. OK.

[Aside: photos 18 + 19 of caliches. Bottom two: Bret Leslie's sample localities. My DAP-2 from top center. Above hammer head in #19.
Photo #20 - DAP 3 in center above level +10 m. Taken from level Ø m.]

General procedure. Place two electrets at each site: one open, one closed - allows subtracting of background.
Mark sites in adit on adit map.

SM6444 + SM6513 At intersection of main adit and two side passages near opening. Hang ~2 m above ground from nail at site #5 painted on ceiling. On map, site RN1
J. Reyes site #5. In center of ore body, according to I.R.

DAP 9/9/94

Note: table of measurements on next page.

SM6465 and SM6449 At I.R. site #15, at NW edge of ore body. Again hung ~2 m above floor.
RN2 on map

SM6491 & SM6410 At IR #19, ~~intersection~~ DAP 9/11/94 end of first main adit. Map # RN3.
~1.6 m off ground.

SM6486 & SM6480 At end of adit, I.R. 15 m from intersection.
On map, # RN4.
~1.7 m off ground

SM6415 & SM6417. In shaft on level # -20 m. Let down on string so that it is about 2 m above where rock on string had hit bottom. Will measure string length later.

DAP 9/9/94

All start times on 9/19/94

Electret #	time start	time final	V init	V final	notes
SM6444	16:10	17:14	719	629	open
SM6513	16:10	17:15	739	729	closed
SM6465	16:22	17:16	731	716	closed
SM6449	16:22	17:16	722	698	open
SM6491	16:33	17:20	722	701	open
SM6410	16:33	17:20	732	721	closed
SM6486	16:35	17:22	733	720	closed
SM6480	16:35	17:22	734	706	open
SM6415	17:03		735		closed
SM6417	17:03		739		open

Later, check readings and take down detectors.

SM6444	18:29	510
SM6513	18:29	715
SM6465	18:32	710
SM6449	18:32	644
SM6491	18:34	654
SM6410	18:34	717
SM6486	18:36	711
SM6480	18:36	640
SM6415	18:51	725
SM6417	18:51	393

Note:
On 9/20, measured string used for SM6415 & SM6417 in shaft at level -20 m. String = 82 m.

DAP 9/19/94

20-Sep-94

$\boxed{\text{DAP-4}}$ More caliche from same site as DAP-3, i.e., NE of deposit. See p. 4.
Photos 2-2, 2-3: close-ups of these rocks (not exactly samples).
Sample DAP-4 has ~1 cm thick layered caliche. On exposed near vertical surface which was a fracture plane.

Photos 2-4 to 2-~~8~~ 7 DAP 9/20 — level +0 m features, including float with beautiful opal + uranyl silicate.
Photo 2-8: Again, site of sample DAP-2. Same as photo 19 described on page 6, but better light.
Photo 2-~~10~~ 9 DAP 9/20: looking across level +10 m, with locality for DAP-3 & DAP-4 in rear center.
Photo 2-10: large gas cavity on wall of +10 level at SW end.

According to EP: along the "major E-W fracture" there is a length with $(234/238)' < 1.0$ — from +7 to -7 m.
Will make observation along fracture.

DAP 9/20/94

Dominant fracture fill is hematite. Also goethite present.

[Aside: Photo 2-11 of Mn-rich calcite xtals coated by more pure calcite.
Photo 2-12 of uranyl silicate near +15/+15.

DAP-5 Photo 2-13. Ellipsoid feature with Jarrosite (?) in outer portion, black mtl. in center (Mn_xO_x?). Took small piece for sample. Patchy uranyl silicate with a few cm around bleb.]

Photos of entire mine area from SE (hill in limestone). Copies to I. Reyes.

Back to EW Major Fracture. Observing with I. Reyes.
IR says maybe low $^{234}/_{238}$ stretch is in less weathered rock - so net removal of U. More weathered - more clays, etc. - more sequestering of U. Net addition of U by water → higher ($^{234}/_{238}$).

DAP 9/20/94

DAP-6 Matrix plus fracture fill
Only one wall of fracture exposed in rock.
Fracture = Fe_xO_x
Host rock = yellowish inner, purplish outer
location 10.25 / 13.50

DAP-7 Matrix quite clayey. Fracture fill has two layers - dk. brown outer, lighter reddish brown inner. Alteration on one face of host rock - small fracture.
location 8.3 / 13.85

DAP-8 From I. Reyes. From wall, about 5m up at extension of Major EW fracture. Intersection of this fracture and a major horizontal fracture. Most of sample is from horiz. fracture. Fe_xO_x + clays (?). Just to left of location "10" pointer on wall.

Photo 2-19: fracture has fragments of host rock in the style of a breccia. N 6/14.

DAP 9/20/94

Around 7/14, a wider discolored zone (brown, yellow). A parallel fracture doesn't have this - only a thin FeOx fill.

DAP-7 Fairly wide discolored zone (~3 cm) w/ FeOx fill. Matrix rocks less weathered than to east.
location 4.55 / 13.8
Away from fracture (> 3 cm) host rock not pervasively clayey; only feldspars. On the other hand, to east host matrix is more clay-rich.

Some clayey host rock again at around +3 in east, but nearby also fresh host rocks.

DAP-10 Only a small bit of FeOx preserved on fracture wall in this specimen.
location 2.05 / 13.50

DAP-11 Two pieces from opposite sides of fracture. Loc. 0.80 / 13.45

DAP 9/20/94

At around 0 m (EW), more weathering in host rock away from fracture. Discoloration generally continues to edge of cleared area, though there is a somewhat less discolored zone around -1 to -4.

DAP-12 Not much of fill.
location - 1.85 / 13.65

DAP-13 Three pieces from three closely spaced fractures.
location -3.90 / 14.05
main
From ~ -7 to ~ edge of clearing, a little less discoloration.
But - a lot at -10 / 15

DAP-14 Main fracture face marked with an "X."
location -7.35 / 14.90

DAP-15 "X" again marks the spot.
Different fracture from DAP-14.
location -7.15 / 14.45

DAP 9/20/94

DAP-16 Small, but contains an entire FeOx + filled fracture.
location -9.80/14.60

DAP-17 Many fractures in this area. Smallest piece is all fracture fill which was adjacent to intermediate piece. Largest piece was separate, but same fracture.
Location -12.25/15.15

DAP 9/20/94

Entering field samples into Goliath Sample Custody Log.
New numbers for samples:

DAP-2 = NOPI-434
DAP-3 = NOPI-435
DAP-4 = NOPI-436
DAP-5 = NOPI-437
DAP-6 = NOPI-438
DAP-7 = NOPI-439
DAP-8 = NOPI-440
DAP-9 = NOPI-441
DAP-10 = NOPI-442
DAP-11 = NOPI-443
DAP-12 = NOPI-444
DAP-13 = NOPI-445
DAP-14 = NOPI-446
DAP-15 = NOPI-447
DAP-16 = NOPI-448
DAP-17 = NOPI-449

14, 16

DAP 5/23/95

Nopal I May 1995 DAP 17

23-May-95

Field work at Nopal I site with E. Pearcy, J. Prikryl, and I. Reyes.

Plugging (?) and capping of Bore Hole 12

With assistance of workman Gil, placed a 1 meter section of 4" diameter pipe into top of Bore Hole 12 and covered around pipe with concrete. (Pipe made of PVC.)

We discovered that the ground cover here is blast debris that may be as thick as a meter. It is difficult to estimate how thick. Probably < 1 meter because the ground level here does not appear to be one meter higher than nearby bare rock surfaces. We decide not to try to dig down to bare rock because we would likely create a large depression for rain water to collect in.

The procedure used is as follows:

1. Clear loose debris and plants in an approx. 2 foot diameter around hole.

Bottles resulting from filtration were put in ziploc bag (one per sample #) which was then placed in garbage bag with other ziploc-bagged filtration samples.
Unprocessed samples placed directly in garbage bags (usually - a few placed in ziploc bags first

DM 9/5/95

This work conducted under ~~Radionuclide~~ DAP 6/19/96
Near-Field RT1

June 19, 1996

Yucca Mtn. ESF (20-5708-563)

Work with Bill Murphy, who is taking notes in notebook 180. On June 18, went to Rainier Mesa; see Murphy notes. [See also page 54; DAP 7/29/96]

Today - tour of ESF tunnel.

Chad Glenn taking photos. (CG)

Bill Murphy also taking notes (WM)

Nelson O'Connell (Fluor Daniel) is our escort. ← O'Connor DAP 6/19/96

Mn oxide coating fractures very common.

See calcite filling fractures and vugs.

Hematite has been reported.

No zeolites yet reported in ESF.

Sides of tunnel less stable than roof → columnar jointing.

Murphy sampled fracture with calcite and hematite growing into lithophysal cavity. (NFA96-03)

DM 6/19/96

More filtration:

WVW95-02 and WVW95-03.

For both: filter 0.5 L and acidify; take 0.1 L into 125 ml bottle unacidified; syringe out ~0.4 L, not disturbing settled particulates, and acidify.

DM 8/24/95

-02 started at 3:50 pm.

-03 started at 4:35 pm.

Resulting bottles:

WVW95-02F = filtered and acidified with 0.5 ml conc HNO_3 as before.

WVW95-02UFA = unfiltered and acidified with 0.4 ml conc HNO_3.

-02F = 0.5 L, -02UFA = 0.4 L.

WVW95-02UF = 0.1 L unfiltered, unacidified.

WVW95-02 (residual) = settled particulates and some H_2O in sm. bottle.

(Note: all bottles this trip are polypropylene (PP)).

Analogous bottles for WVW95-03.

Filtration Blank:

① Took 1 L nanopure water in 1 L PP bottle.

② Syringe out with 60 cc syringe and acid-cleaned FEP teflon tubing.

③ Remove tubing and attached 0.2 μ syringe filter (PVDF, 25mm diameter).

④ Filter into 0.5 L bottle.

⑤ Repeat steps 2, 3, 4 with new filter each time, to total of ~0.5 L filtered water. Label this W95-Blank-F. Add 0.5 ml conc HNO_3.

⑥ Pour out ~0.1 L into 125 ml PP bottle, labeled W95-Blank-UF.

⑦ Add 0.4 ml conc. HNO_3 to remaining nanopure H_2O in 1 L bottle, labeled W95-Blank-UFA. (~0.4 L)

This mimics sample filtration method, except sometimes unfiltered samples were removed from original sample bottle by syringe rather than pouring.

Acidification was always 1 part conc. HNO_3 to 1000 parts H_2O.

Remainder of day - water collection and analysis at BH-12. Detailed notes taken by WM (notebook 117, page 44). I was more or less the leader, concentrating on electrode measurements and titrations. LK was the primary bailer. RB mainly assisted me with titrations in the afternoon.

We bailed out the hole until very little H_2O remained in it. See WM's notes for estimates of total H_2O removed. Tomorrow (8/24) we will see if the water level has recovered at all, and collect more if so.

8/23 p.m., WM and I filtered three samples with 0.2 μm syringe filters. Took ~½ for filtering. WM again took notes.

DAP 8/24/95

24-Aug-95 field work cont. DAP

A.M. - checked BH-12. Water level not recovered. No more sampling here.

Go to well west of Nopal I (locate on map later). WM again takes notes in book # 117.
Measure depth to water.
Use teflon bailer, but very difficult to retain H_2O in bailer while pulling up. Sample #01 is ~0.3 L that stayed in.
I. Reyes and LK then let bailer fall ~4 m from top of water with bottom plugged by stopcock. H_2O enters from top of bailer and stays in on way to surface. Collect 3 L this way (see WM notes).
Titration chemistry: (1) CO_2 done in field (2) dissolved O_2 flocculation started in field - collected straight from bailer, (3) alkalinity and hardness done in Nopal camp dining hall.

29-May-95 DAP

Enter new DAP samples into custody log.

DAP-18	=	NOPI-499
DAP-19	=	NOPI-500
DAP-20	=	NOPI-501
DAP-21	=	NOPI-502
DAP-22	=	NOPI-503

23-Aug-95 Peña Blanca Trip - DAP

My objective for this trip - water sampling. Collect and analyze H_2O from borehole BH-12, well to east of Nopal I, and perhaps spring to west. Have brought acid-cleaned PP bottles, nanopure H_2O, syringe filters, bailer, water level meter, meters for T, conductivity, pH, oxidation-reduction potential; Hach chemistry test kit, reagents and standards.

This a.m. first hike with Bill Murphy (WM) and others searching for flow seeps on west-side dip-slope of Nopal I cuesta. Did not find.

Note: Participants in trip: DAP, WM, Jim Prikryl (JP), Ron Green (RG), of CNWRA; Linda Kovach ~~(LK)~~ DAP 8/23/95 (LK) of NRC; Rob Bowman (RB) of New Mexico Tech as observer.

DAP 8/23/95

DAP-21 Collected with I. Reyes.
Calcite vein w/ breccia. Near horizontal.
Located ~3 m past "16" mark (i.e., ~2 m from "17" mark) on wall of Level +10. 3 meters up wall.
Photo 21 of sample locality

Photo 22
near "14" on wall, ~3m up.
Complex calcite-hosted breccia.

Photo 23
Calcite filling vertical and adjacent horizontal fractures.

DAP-22
Small vertical calcite vein.
~0.3 m to right of BH-6 hole. (metal tag just below sample).
3m past "19" mark; about 2.5 meters above floor of Level +10.

Retrieve Radon monitors. Close open cans and take all out of adit.

16:15	close	SM6388
16:17	close	SM6486
16:18	close	SM6465
16:20	close	SM6513
16:23	close	SM6446

Final readings at truck

	t_F	VF
SM6453	16:39	659
SM6388	16:38	97
SM6480	16:37	502
SM6486	16:38	315
SM6444	16:34	319
SM6513	16:34	2
SM6491	16:40	475
SM6410	16:40	16
SM6449	16:35	576
SM6465	16:36	292

DAP-19

Photo 13: sample is caliche on face above and to right of lens cap (with "hole" in the middle of it).
Broke piece of rock into smaller pieces, each containing a face with caliche. All from same caliche layer.
Sample from about 2 m below DAP-18 (therefore at ~ 22 m level), along strike to east ~2 meters.

Radon - First check on voltages
o = open electret, c = closed.
Transcribe first readings from previous pages.
Assume no V accumulated between t_0 and opening at t_1.

~~SM~~ DAP 5/24/95	t_1	V_1	t_2	V_2
SM6453 (c)	8:55	700		
SM6388 (o)	8:55	712	11:32 ~~504~~ DAP 5/24	504
SM6480 (c)	9:00	540		
SM6486 (o)	9:00	639	11:35 ~~562~~ DAP 5/24	562
SM6444 (c)	9:19	432		
SM6513 (o)	9:19	618	11:38	526
SM6491 (c)	9:29	524		
SM6410 (o)	9:29	632	11:41	521
SM6449 (c)	9:34	609		
SM6465 (o)	9:34	629	11:43	557

Note: at 14:00, both standards gave 2V higher than certified. *

	t_3	V_3
SM6453	14:07	679
SM6388	14:06	283
SM6480	14:19	527
SM6486	14:18	439
SM6444	14:22	392
SM6513	14:23	3!
SM6491	14:13	494
SM6410	14:13	277 ☆
SM6449	14:26	591
SM6465	14:26	413

Discharged! Can see dust + dirt on surface.

* Meter slide was open because rubber band slipped off. Higher readings may be due to dust settling on plate which was uncovered.

☆ Took electret off meter after reading 291 V, then re-measured to get 277 V. Repeated + got 258 V.

DAP-20

Calcite from breccia vein. Breccia clasts are altered tuff. Photos 14 + 15 of adjacent breccia zones of vein. 5.6 / 32.8 on level +10.
(near large calcite deposit in "pit")

New site: RN6

At 9.2 m from intersection of main adit. Southwest corridor of adit.
End of 11.5 m from intersection.
SM6480 closed
SM6486 open 9:00

RN7

N23E, 32 ~~SW~~ DAP 5/24/95 NW
Contact at base of Nopal tuff, top of vitrophyre.
N65E, 20 SE very irregular surface
N35E, 15 NW
Strikes + dips taken at ~16 m from intersection with main adit NE end of adit system.
At 15.8 m mark, hung detectors.
SM6444 closed
SM6513 open 9:19

Note: at ~9.5 m NE of main intersection, see contact at base of wall on SE wall of adit. (contact between tuff + vitrophyre).

Site RN4 (see page 7)

SM6491 closed
SM6410 open 9:29

new site RN8

SM6449 closed
SM6465 open 9:34

At 4 m 5/24/95 3 m mark on ceiling, NE of main intersection.

Note. See major ~EW fracture which intersects the center of the adit ceiling at ~5.5 m SW of main adit intersection.

DAP-18

Caliche filling fracture (oriented N70W ~90)
At ~24 meter level (re: I. Reyes looking from +10 level).
Sight to "point" or "promontory" on level +10 → S08W.
Photo 12

E. Pearcy's NOPI-452, 453 — I took photos #9 and 10 of this fracture sampled by ECP. ~+23 meters (above base level) on wall above Level +20.

Looked at +10 Level and discussed features with ECP. He is not convinced that there are any true faults, nor that the ore body originated due to the intersection of two major fracture/fault zones. (These are I. Reyes' ideas.)
He also pointed out that he has not observed a lot of true breccia in the ore body. Just small, local breccias.
~~Reddish E-W fracture sets in northern portion of Level +10 may be surface traces of ~~ DAP 5/23/95
Calcite deposits in northern portion of Level +10 may be deposited on subhorizontal fracture sets.

Came to NE corner of Level +20 (where it essentially intersects the ground surface) and see caliche coating tuff fractures. Return later to sample.

24-May-95 DAP

More Radon measurements in Level +0 adit.
First (at track) measure voltages on electrets.
→ Blue Radelec electrets

Standards:
R2018 = 265 V ✓
R2025 = 258 V ✓ OK

electret #	time	V	
SM6513	8:33	618	
SM6444	8:34	432	
SM6410	8:35	632	time = t_0
SM6491	8:36	524	
SM6480	8:38	540	
SM6486	8:39	639	
SM6452	8:41	700	
SM6388	8:42	712	
SM6449	8:43	609	
SM6465	8:44	629	

Site RN! (as before, see page 6)
SM6453 closed
SM6388 open 8:55

We plugged the hole with a plastic bag filled with plant material to minimize the amount of dirt and rock going down the hole.

2. The pipe was pushed down the hole until resistance was met. Using a chisel, we loosened rocks which blocked the pipe. As dirt and stone fell down the hole, we could hear splashing from the bottom of the hole. Evidently, there was a large amount of water in the hole. We pushed the pipe down until 0.5 ~~1.5~~ meters were submerged below the surface and the pipe could be lowered no more.

DAP 5/24/95

3. Concrete was made by mixing 1 part cement with 1 part sandy blast debris. A minimal amount of water was added just to wet the concrete. Barbed wire was wound tightly around the base of the exposed pipe as a reinforcement. Concrete was applied to the wetted ground around the pipe, and a mound was gradually built. Photos document the concrete application.

Note: There was a brief, heavy rain storm about 15 minutes before we began the work. It was, however, not the source of the water in the hole, for a few reasons:

① The hole was covered with a metal plate, and the ground under the plate was dry.

② Rainfall total was small.

③ About 3 meters away, another bore hole had been covered with a large rock. I dropped a stone into it and could hear it hit the bottom with no splash.

The pipe was capped with a PVC cap which fit tightly.

Final layer of concrete was wetter than others in order to make a smooth surface.

(Note: space around base of exposed pipe was stuffed with plastic and cloth.)

DAP 5/23/95

See fluorite associated with fracture-filling calcite. CG takes photo. ~5243 m.
Concentric Mn oxide → hematite → calcite (bottom layer → to top).
Fluorite predates calcite; maybe contemporaneous with Mn?
But see "spots" of Mn oxide deposited on fluorite (Sample NFA96-08 DH 6/20/96)
~~(Sample NFA96-04 DH 6/19/96)~~
See consolidated sampling sites for A. Flint, Z. Peterman, J. Fabryka-Martin at around the 5000 m mark, and elsewhere.

Another example of fluorite-calcite-Mn association at 4714 m. Photo by CG. Looks like where a Peterman sample was taken.

Around 4480 m, see some alteration inward from the cc veins. A rind of whitish rock ~ few mm wide. Seems to die out by ~ 4430 m.
My thought - could they just be due to imbibition from the fractures

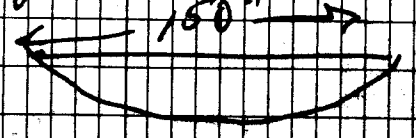
DH 6/19/96

resulting in deposition of cc away from fracture surface?
WM thinks not; they are real alteration haloes.

3541.58 [36]Cl site. A green coating on slickensides, precluding cc. Check Fabryka-Martin report.

NFA96-05 collected nearby.

Note for Bobby Pabalan + Shotcrete only used to Alcoves 1 and 2 near North Portal.

Afternoon - stop at concrete invert fabrication site, CG takes photos.
4 ft. long
X-section 

Concrete mix designs obtained.

DH 6/19/96

DFP after on June 19, 1996, activities written on 6/20.

DFP 6/20/96 Impressions - O'Connor gave a good tour, was knowledable on geology, mining, ESF operations.
33 Studies seem thorough, careful.

Variety of rock physical properties is striking.

Afternoon, Calico Hills.

After reaching a dead end on a jeep trail, took paved road north of Site "G" (NTS map) on Jackass Flats. "G" labelled as "Trailer Park" on Jackass Flats 7.5' Quadrangle Topo Map.
(On 2nd look at NTS map, "G" may refer to the road going off to the east.)
Followed paved road to "Test Cell C" which is reached by a left turn off Jackass Flats Rd. "Substation" on topo map.
Turn left onto dirt road before reach Test Cell "C", cross Topopah Wash, then turn right. At first, this doesn't coincide with the road on the topo sheet, but eventually it does. (the turn is after you come out of wash.)

Travel north on dirt road (good condition) until reach a blocked gate (locked chain). Firing Range beyond. "Barricade" marked on topo sheet (Jackass Flats Quad).

Using Maldonaldo, 1985 geologic map (USGS Misc. Invest. MAP I-1519), work out structural-stratigraphic relationships between exposures of Th - rhyolite lavas & tuffs of Calico Hills, and Tpt - ~~Topopah~~ DFP 6/20/96 Topopah Spring Member.

Just off west side of road for ~100 m back from the gate, there are exposures of Th which are near the top of the section — overlying Tpt is up the hill.

CG, WM, and I came down the hill from Tpt into Th. What convinced us that we were in Th were the presence of pumice clasts. Sample sequence taken by WM noted in notebook 180.

DFP 6/20/96

DAP 6/20/96

This section is in a fault block. North side is thrust over Paleozoic Eleana Fm. South side is normal fault against Tpt.
Faults on Maldonaldo seem reasonable.

Don't see contact - covered by rubble on slope.

Calico Hills samples are highly weathered, e.g. Fe stained.
Cannot identify, e.g., zeolites. Pumice clasts seem well-preserved texturally.

There are other potential sites to view Th - Tpt contact further west in the Calico Hills. It appears one area can be reached by jeep trail from the end of the road going west from "Trailer Park" as mapped on ~~Jackass Flats topo sheet~~ DAP 6/20/96 Maldonaldo map. Road goes to two "Prospects" locations.

What about Comb Peak — Paintbrush Canyon area?

DAP 6/20/96

Tpt outcrops at the described "Barricade" site seem rather silicified, hard, white (with red-stained fractures.

Our traverse down-section, plus looking across canyon, suggests there is a transition downward within Tpt from less-stained, white tuffs to highly red-stained tuffs.

In summary, this might be a good site to view top of Th in a structurally complex setting. (Easily accessible, too.) DAP
You could also walk not too far to the southwest to see the stratigraphic contact at another location (we didn't).

DAP 6/20/96

42

June 20, 1996

Spend ~ 1 hour in YMP Field Operations Center (FOC) taking notes and planning.

A key objective today is Prow Pass, where Th upper contact can be viewed.
Will refer to Broxton et al., 1993, LA-12542-MS, report on six nonwelded tuff sites.

Prow Pass:
Looking at Th, Tpt.

NFA96-13: Th, zeolitized, pumice fragments.

NFA96-14: Tpt - (Topopah Springs)
From just above contact with Th (maybe 2-4 m above).
Welded appearance of pumice clasts
Abundant black grains that are probably glass.

NFA96-15: Th from about 4-5 m below (downhill) NFA96-14. "Typical" Calico Hills.

43

These two samples (14 & 15) appear to be from very near the "Central Vertical Section" of Broxton et al, Fig. 11.

Note: NFA96-13 was from just below a layer with abundant xenoliths (including rhyolite of Trmr).

Tpt is much more fractured than Th, but Th is not fracture-free.

Note: Section of Th above knob just South of Prow Pass is more reddish than lower section.

NFA96-16 is from upper part of Th; appears to be particularly fresh.

NFA96-17 collected by WM. ~15 m from NFA96-18 " " DAP.

17 is just NE of 18; stratigraphically, 18 is maybe 1-2 m higher.
Both are Th, in lower part of exposed section on isolated knob.

NFA96 - 19

Calcite (+ opal ?) deposit - looks like I would call caliche. With included clasts of host Paleozoic carbonate rock.

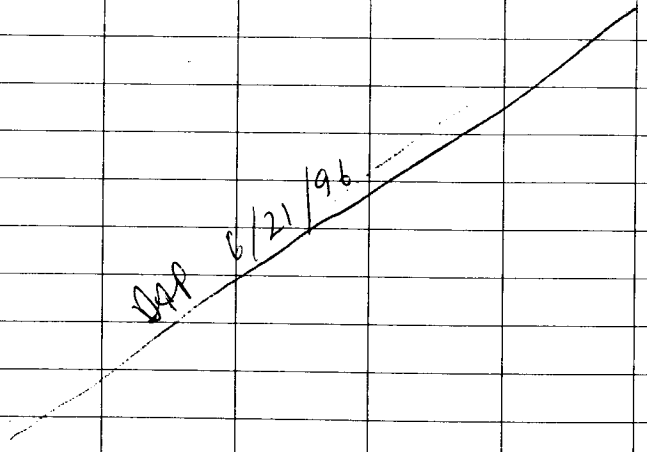
Located just off Hwy 95 on Beatty 1:100 000 topo sheet, near where Skeleton Hills intersect highway.

Walked thru narrow canyon in carbonates, saw no caliche. Then saw when reached where canyon opens, turned left, ascended end of road extension.

Carol Hill et al. claim pyrite coexists with calcite and opal here.

Host rock is €bp : Papoose Lake Member of Bonanza King Fm. Cambrian.

DAP 6/21/96



June 21, 1996

Go to Daisy Project outside Beatty - future gold mine.

WM collects NFA96 - 20 and - 21.

NFA96 - 22 collected by me. Reminiscent of zeolitized tuffs of Calico Hills.

Solotario Canyon

USW WT-7 DAP 6/21/96

~~USW T-7~~ Drill Pad

Collect calcite + opal samples.

NFA96 - 23 Opal-rich

NFA96 - 24 Massive caliche

NFA96 - 25 layered caliche

NFA96 - 26 Collected by WM for search for pyrite reported by Carol Hill et al.

Photo 8 West face of YM from Solotario Canyon. Lower-most unit is Topopah Spring.

NFA96 – 27, 28, 29

From east wall of Solotario Canyon.
"Fossil fumaroles" in Paintbrush Tuff
Non-welded unit lying above Topopah Spring (Tpt)
Lower cliff-former is Tpt, upper is Tiva Canyon.
Non-welded unit is between.

27: Highly altered/weathered tuff from 2-3 m above contact with Tpt.

28: Less altered, from 20-30 cm above contact. (Site has been previously marked by somebody with a yellow flag).

29: a fault or fracture cutting #28 outcrop at ~45° dip looks like could have been fumarole. This sample is from adjacent to fault/fracture 30-40 cm above #28.

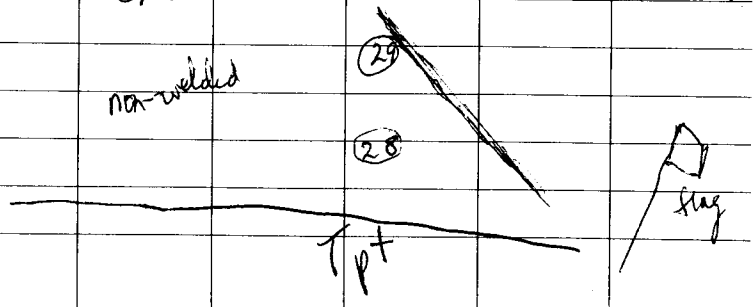
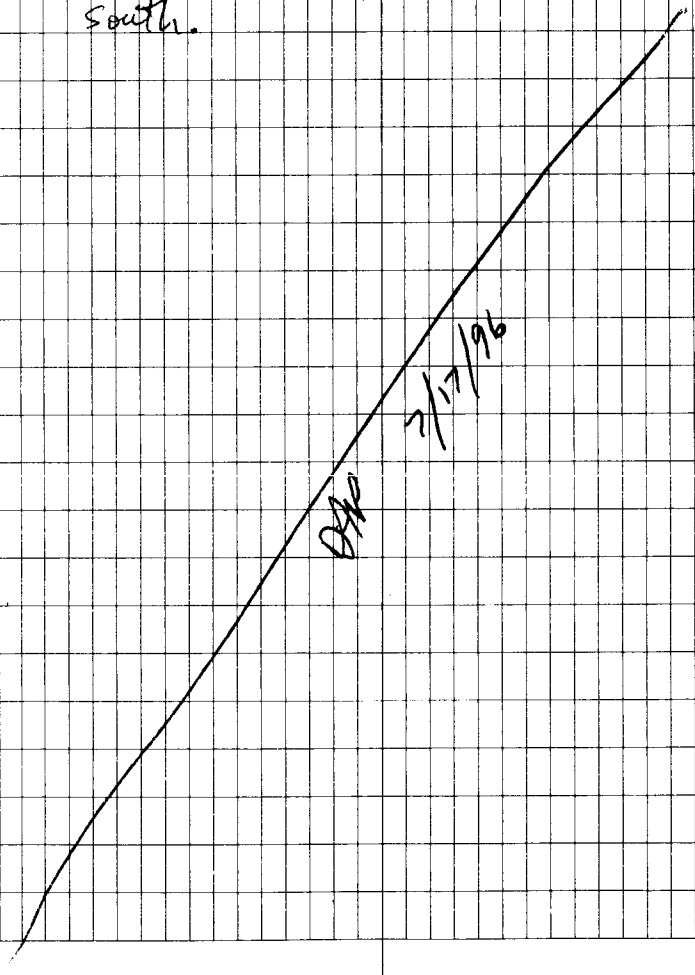


Photo 9 – looking up at the sequence from parking area. A road leads up to here – upper part is visible in photo.

Photo 10 – Lathrop Wells Cone to south.



Samples from June 1996 trip to Yucca Mtn. Area

20-5708-563

7/17/96 DAP — On 7/15, used saw to make chips for thin sections. Chips sent to Mineral Optics Laboratory, Wilder, Vermont.

Sent chips for all samples (01 – 29) except 05, 06, 08. These were too small or had surface crystallization that do not require thin sections for examination.

On thin section order, specified 27 x 46 mm, one-side polished, color resin impregnation.

Notes made on specific samples while preparing chips:

01: Two pieces very crumbly. Chip sawn from piece with hard, greenish interior. Marked area to be sectioned on face.
03: Interior is tuff. Marked area to section.
07: Very friable.
14: Tried to cut ⊥ welding flattening, but couldn't see a preferred flattening plane. Sent two chips; wrote on bag "choose either."

19: Friable. Chip is from the opal-rich piece, which is more coherent.
20: Sawn from the fresher of the two big pieces.
23: Cut ⊥ opal/calcite contact.
24: Same as 23.
25: Cut ⊥ layering.
26: Cut ⊥ layering.
27: Highly weathered, crumbly.

On 7/16, sorted samples for powdering to be performed by Jim Prikryl. Notes I gave to him are recorded in the WordPerfect file "NFA96 samples to powder":

01: Make two powders: a. hard interior of roundish piece; b. more altered, friable tuff.
19: Try to sample only the caliche – not the silicified, inclusion-rich bands.
23: Try to make powder 50/50 opal/caliche.
24: Sample across the banding in the sawn piece, trying to keep proportions.
26: Same as 24; also try to avoid inclusions, if possible.

JP's notes follow.

7/17/96 JP

Preparation of whole rock powder

Rocks collected by DAP and WMM during their Yucca Mountain field trip were powdered for later chemical analysis and XRD analysis.

Powdering was accomplished using a SPEX Mixer mill with tungsten carbide vial. Samples were labeled as follows. Wt of powder + short description are also included.

	wt
NFA96-01-WR1	22.59g
Hard green material	
NFA96-01-WR2	21.17g
Friable tuff	

	wt
NFA96-02-WR1	21.86g
Tpt with Mn+Fe fracture deposits	
NFA96-07-WR1	24.79g
Fossil fumarole site. Near base of Ptn	
NFA96-09-WR1	29.94g
White silicified tuff	
NFA96-10-WR1	24.67g
Red silicified tuff	
NFA96-11-WR1	22.46g
Welded tuff	
NFA96-12-WR1	20.57g
Orange, altered, unwelded Th	
NFA96-13-WR1	22.10g
Th - zeolitized, pumice fragments.	
NFA96-14-WR1	23.54g
Welded Tpt	

NFA96-15-WR1 22.15g
Th or non-welded Tpt

NFA96-16-WR1 22.88g
Th fresh or Tpt?

NFA96-17-WR1 20.47g
Th

NFA96-18-WR1 22.31g
Th

NFA96-19-WR1 15.43g
Caliche

NFA96-20-WR1 21.89g
Silic. field tuff

NFA96-21-WR1 27.2g
Hydrothermally altered tuff

NFA96-22-WR1 19.77g
Tuff

NFA96-23-WR1 26.43g
Opal with caliche

NFA96-24-WR1 26.98g
Massive caliche

NFA96-26-WR1 26.04g
Caliche

NFA96-27-WR1 13.07g
Nonwelded pantheric tuff
highly altered

NFA96-28-WR1 21.83g
Nonwelded Pantheric Tuff
less altered

NFA96-29-WR1 21.12g
Nonwelded Pantheric

7/24/96

7/24/96 DAP

Rationale for 6/96 field work recorded in previous pages, beginning on page 35.

This work is part of the effort to use paleohydrothermal events and products in the Yucca Mountain (Y/M) area as analogs for the heated environment in the near field of the YM repository.

Many of the silicic tuffs in the area have undergone post-eruptive alteration of many types. We are interested in observing rocks which have been subjected to high temperatures, with reactions with water and its dissolved constituents resulting in chemical and/or mineralogic changes in the tuffs. Such changes (particularly mineralogic) in tuffs surrounding the repository can affect the near-field environment in many ways, e.g.: 1. create or destroy minerals effective at radionuclide sorption, 2. fill fractures, or dissolve fracture fillings, 3. alter physical character of tuff, such as by silicification.

In this technical work, we are analyzing field relations at many scales to describe

the nature of natural alteration, e.g. pervasive versus fracture-filling; stratigraphically or geographically controlled.

We are collecting many samples, which will be analyzed for mineralogy (e.g. petrography or X-ray) and chemistry. Data will be used in attempting geochemical modelling of the alteration process. This will help in evaluating models of changes in the near field of the proposed repository.

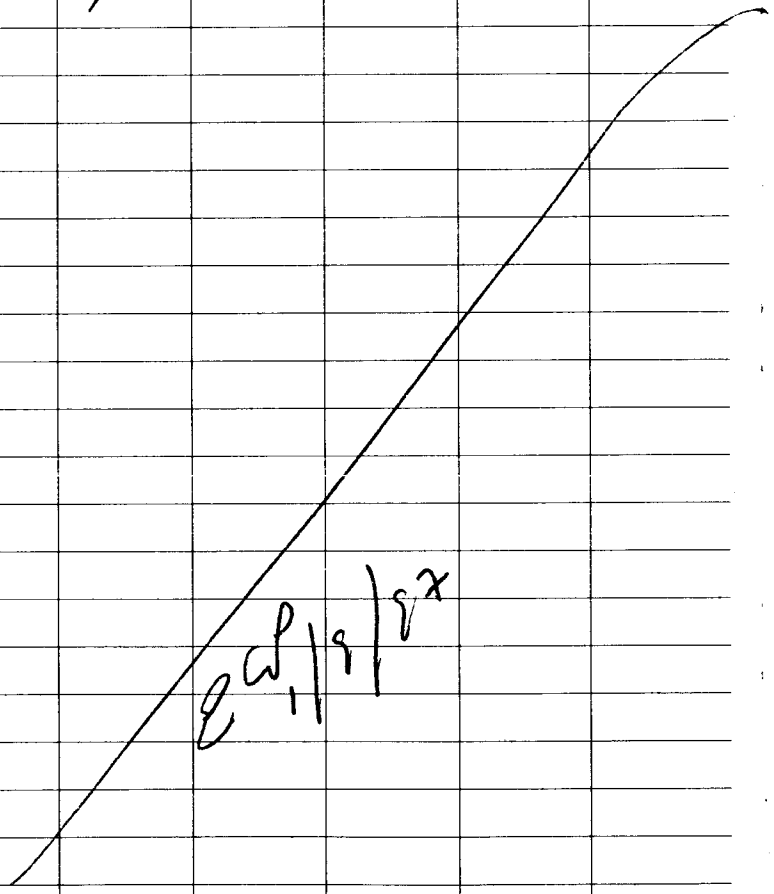
The field work and sample preparation carried out in June and July, 1996, are described on pages 35 - 53 of this book, and pages 1-16 of book # 180 (W. Murphy).

7/24/96 DAP

7/30/96 DAP

Further treatment of the NFA96 samples described on previous pages is covered in CNWRA notebook # 172.

Today, prepared subsamples for XRD analysis. See #172.



I have reviewed this notebook and find it to be in general compliance with QAP-001. There is adequate information for another qualified person to repeat the activities.

S. C. Ren

4/9/97

5/6/03 DAP

Trip to Nopal I, May 2003

DOE sampling trip to get water from new wells at Nopal I.

Persons present:
Steve Goldstein - LANL
Eric Smistad - DOE
David Pickett (DAP) - CNWRA
Jim Prikryl - CNWRA (JP)

Well PB2 - will locate on map later. 50 m from center of ore body, on level +10.

Others present:
Rodrigo de La Garza - UACH
Ramon _____ - UACH
Victor _____ - site worker

Victor constructed a bailer from PVC pipe and a metal float valve. Lowered with a hand-powered reel on monofilament nylon line. (Took several photos.)

As they were bringing the bailer back up, the line broke.

~~Note~~ DAP 6/6/03

Got another bailer - only ~1 liter capacity, versus almost 4 liter for the lost bailer.

Meanwhile, drilling is being conducted in PB1 - the core throughout ore body. For a second time, the rig was stuck (1st time at ~110 m, 2nd at ~200 m).

They are now doing a third hole to continue the core. Many photos.

Red rig is hammer drill to take down to level where core ended. Unused yellow rig next to it is the coring rig. Perhaps will be finished later this week.

With smaller bailer, Goldstein + Smistad take a few liters.

We sampled "PB2-503-___"
503 = May 2003

60 JP performed chemistry analyses on first batch of water (~1 liter). Recorded in notebook #589.

Water has a lot of particulates and is quite "dirty". S. Goldstein and JP both obtained pH > 11, so this water must be considered suspect.

We took 4 bailer loads, i.e., 3-4 L. I filtered some of the water with a hand pump and a 0.45 μm cartridge filter, model: AquaPrep 600 capsules, Lot #70270. Filtered water was collected in 1 liter receptacle in front of hand pump.

Samples: Taken in order, a to d.

PB2-503-1a 1 liter filtered, with 3 ml 1:1 HNO_3 added via pipet. Bottle topped off as well as possible to minimize air space.

PB2-503-1b 1 liter filtered, with 3 ml 1:1 HNO_3 added via pipet. Not filled to top

(Both in PE bottles)

PB2-503-1c 250 ml in amber glass bottle. Unfiltered and unacidified. Topped off bottle. Let water settle for a few minutes before pouring into sample bottle.

PB2-503-1d 250 ml in amber glass bottle. Filtered and unacidified. Topped off bottle.

5/7/2003 DAP

Day 2 of Nepal trip

Go to PB3, which is the water well 50 meters downgradient of the core hole PB1. Take many photos. Note drilling mud covering much of Level +00. ~~[illegible]~~ added 5/8/03.

PB3 is on edge of Level +00 – drilling mud from PB1 is not flowing near it. UACH van got stuck in mud.

Victor and Eduardo (?) lowered the new bailer (again 4 liters – like the one lost yesterday) into PB3 with

a nylon rope. Do not reach water table (WT) – rope is not 250 m long as they had said.

Note - during this period, changed SmartMedia card in camera from "Pickett 1" to "Pickett 2."

Use small bailer with small line and monofilament fishing line. SG got a liter or so for chemistry measurements. He obtained a pH of 8.4.
Workers got a thicker twine and then lowered again the large 4-liter bailer. They had trouble judging when the bailer hit the WT, and they consequently lowered it too deep. When it came up, it was full of rich brown, very muddy water. Useless. A subsequent small bailer-full was still muddy. Abandon PB3 for now.

PB4 This is the same well we sampled several years ago as well "WVW."

JP performs chemistry analyses – see notebook 589.
As for PB2, we took samples after SG had obtained his 2-3 liters. At PB4 we used the new 4 liter bailer, so all samples are from one bail.
PB4 is an old well, with a metal casing cut off very near ground surface (so it's easy to get it contaminated by dirt at surface).
Samples

PB4-503-1a 1 liter, filtered and acidified with 3ml 1:1 HNO_3.

PB4-503-1b 1 liter, filtered and acidified with 3ml 1:1 HNO_3.

PB4-503-1c 250 ml in amber glass bottle, unfiltered and not acidified.

PB4-503-1d 250 ml in amber glass bottle, filtered and not acidified.

Note: we need to find out the map locations of all wells.

JP's pH measurement was 9.9 at PB4. This water was considerably clearer than PB2 and PB3. But note that, as mentioned on page 63, the well is not well protected from contamination.

POCOS Ranch Well - This well is down the road on the relatively flat alluvial surface. It has a pump powered by a gasoline engine and has a tank.

Victor and Ramon started up the pump and SG collected ~3 liters for us in one of his collapsible 1-gallon jugs. (We arrived late because we were still at PB4 filtering and measuring.)

JP measured pH and alkalinity — the latter on a filtered sample. pH = 7.15.

All samples are from the same batch!

POCOS-503-1a - 1 liter, filtered and acidified with 3 ml 1:1 HNO_3.

POCOS-503-1b - 1 liter, filtered and acidified with 3 ml 1:1 HNO_3.

POCOS-503-1c - 250 ml in amber glass bottle, unfiltered and unacidified.

POCOS-503-1d - 250 ml in amber glass bottle, filtered and unacidified.

After sampling was completed, Steve Goldstein decided to not return the next day to re-sample PB3. He prefers to go to UACH to train personnel in water sampling procedures. Also, he does not think PB3 samples will be useful: the water column in the well was completely "contaminated" by the mud that was stirred up when the bailer was lowered to the bottom (page 62).

Also, the pH was rather high (8.4) and there were a lot of particulates even in the cleaner sample SG obtained before the mud was stirred up. It was cleaner than PB2, however.

My thoughts: the mud may not even settle completely by tomorrow, and if it does, it must have affected the water in either or both of at least two ways:
- reaction with clay
- sorption of metals onto the clay.

We can't really guess if the clay is native or is from drilling mud. It is not at all reddish like the Colorado Fm.

It seems clear that any samples obtained on Thursday would be highly suspect.

Eric Smistad decided also not to go to the site. Therefore, neither did we on Thursday.

5/8/2003 CAP

More thoughts. As discussed on pages 65-66, it appears highly unlikely that any samples obtained from PB3 would be meaningful in a supportable way.

Also, PB2 is questionable because pH was so high (> 11) and water was so dirty. In first bailer-full (and maybe others), there was a whitish lumpy substance floating on the surface of the water.

At PB4, the high pH (9.9) was quite surprising. We previously obtained 7.7 years ago.

In sum, I believe all PB samples we have taken will have to be interpreted with caution, in terms of how well they represent the natural system. Keep in mind that drilling of PB2 was completed only a few weeks ago, and PB3 only last week. Meanwhile, drilling on PB1 continues.

The system has been and is being perturbed, and there has been no purging of the wells.
Reliable sampling awaits the arrival of the downhole pump. ES says it should not be a problem providing splits, but we may want to come down ourselves if LANL does, once the pump is working, wells have been purged, and the "natural" system has returned.

The core is being described by Ramon. It is currently stored at the Nopal camp in wooden boxes. Cuttings from PB2 and PB3 are stored in plastic bags in plastic boxes, also at the camp.

5/13/03 DAP Follow-up notes from 5/8/03 discussions with Nacho (Dr. Ignacio Reyes)

According to Nacho, the gamma log on well PB2 showed no anomalies at or near the water table - which is located in the conglomerate unit

Pozos

between the volcanic deposits and the underlying Cretaceous limestone. However, in well PB3, which is located nominally down-gradient of the Nopal I body, there is a spike in the gamma log within the conglomerate, just below the water table. Gamma activity in the underlying limestone is at background levels. Uranium, etc., seems to be migrating to the water table and concentrating there.

I had written a note on 5/6 that Nacho said that in PB1, visible U ore stops at 105 m depth, and that gamma activity then decreases gradually 50 m down. However, I now think this is old information, because on 5/8, Nacho said they had not yet done any downhole gamma on PB1.

Back to PB3 for a moment: is the gamma concentration near water table a hydro or chemical effect? Don't yet know, suspect chemical.

I then discussed with Nachs the mud we retrieved from PB3 when the large bailer was lowered all the way to the bottom. He is fairly certain it is drilling mud. While PB3 was being drilled, they encountered a tunnel and drilling mud return ceased. They continued drilling for about 27 m more, so a lot of drilling mud accumulated in the tunnel. Prior to and during casing, therefore a lot of mud could have accumulated at the base of the well. We stirred it up when UACH workers lowered the bailer all the way down.

It will be important to try to clean out the well before taking meaningful samples.

Once the new pump is received at the site (perhaps a few weeks) M. Murrell and J. Oliver may travel down to sample the wells.

June 21, 2006 DAP

Site Visit to Nopal I analog site.
From SwRI Geosciences and Engineering Div:
David Pickett (DAP) + Kevin Smart.
From Lawrence Berkeley Natl. Lab (LBL):
Pat Dobson and Paul Cook.
Working under an OSTI project.
We are here representing the NRC to visit a DOE site. The main activities of the LBL staff are two maintain and retrieve samples from the adit seepage collection system and to obtain samples from some of the wells.
Note: Well PB2, upgradient from the ore body, has some obstruction in it (dropped in by an intruder?) that prevents any sampling.
Also - an LANL team that was to sample the wells PB1 + PB3 by pump will be visiting later in the summer.

First, Pat Dobson (PD) took Kevin (KS) and I on a tour. I took photos all along the way.
We walked across Level +10 and looked at wells PB1 + PB2. PD and KS

discussed GPS positioning and precise locations of the wells and other features. It has been impossible to keep the wellheads secure. Locks ~~not~~ DAP 6/21/06 have been broken, etc. We looked at slickenslides near the calcite "pit" and some structural features of the walls. We then visited the LBL-installed meteorological station, just above Level 10 southwest of the ore body. PD noted that since the station was installed in March 2006, it has measured only 5 mm of rain. And there apparently was no rain between January and March. The station can store up to ~6 months of data (temp., precip., wind, humidity).

This year has been especially dry. Very little winter rain, and the monsoon season has not yet started.

We then walked to the area where UTEP worked on an ore-rich boulder that had rolled downhill from the (former) ore storage pad. PD says that the ore was not stored on the flat surface

of purple basal vitrophyre of the Nopal Fm, ~~The sh~~ DAP 6/21/06 as I had believed. Rather, the site is further down the road toward the camp, on a sloping surface. Took photos of high-grade ore boulders.

PD pointed out that his budget had been cut to 25% of the original amount, due to overall DOE cuts. This has made it very difficult to get things done. He is still working on re-establishing the contractual relationship between DOE and UACH. When that is completed, he hopes to employ two students of Prof. Lourdes Villalba (who did her PhD on radionuclides in Chihuahua-area waters).

We then looked at the north-facing (or NE-facing) DAP 6/21/06 wall above Level +0. PD pointed out slickensides coated with uranium minerals. Photos. This is a structural zone that marks the edge of the highly mineralized rock (Mostafa Fayek's model).

DAP
6/21/06

A NW-trend ~~fault~~ DP 6/6/06 fault or shear zone (photo along trend) separates reddish, mineralized rock from barren rock on southwest side.
Photos of green opal and U minerals much like what I studied. 2 peso coin for scale. KS looked at slides.

PD then led us on a tour of the Level +0 adit. Photos of old and new seepage collection systems. Photo of equivalent of "13 m north E-W" fracture zone. Pressure transducers for measuring seepage amounts (data stored). Temp/relative humidity sensor. Atmospheric pressure sensor. Data logger to keep all these measurements. Animals have disrupted the bottles, pulling some up and lodging them against the wall so they could sip dripping water. Scratches on bottles. Only affects outer bottles. Back of adit is the driest. One bottle at rear corner has never had water. (New seepage system installed in April 2005, pressure transducers in Nov 2005).

Photo of bottles at rear showing no change in water level since November. Tells us two things:
- little to no precip since Nov 2005.
- Water does not evaporate out.

Back area got a fair amount of seepage by September 2005. However, the front part did not show any water until January 2006. Delay in front part. Shorter fractures? (PD) Longer travel time consistent with U-series data: higher [U], $^{234}U/^{238}U$ closer to 1, compared with rear part of adit.
They installed a bottle with a cover over the collection trough to see if there's much condensation. An animal disrupted the cover.

Well PB1
PD takes a water level reading. (Solinst Model 101 meter).
To top of PVC casing: 734.8 feet.*
Add 8.4 cm to get wellhead top.
Then obtain a sample via bailer.

* Same as Mar 2006 reading.

PD first obtained a 'wash' sample. Actual sample was filtered.

PB3

Water level 705.8 feet. Add 15.6 cm. In May 2006, 705.65 ft.

(Note: PD says PB4 is not down-gradient from PB1, 2, 3. Its water level is within the range of the latter three.)

(Found an instrument. Like a pen with a lens at one end. Victoreen, 541L. Model # unsure.)

PB4

Rancher is here pumping the well. He shares water from the hose with PD. He's filling a tank.

PD filters and samples. (Note: he does not acidify in the field nor take any field chemistry measurements.)

Pozos Ranch Well

Pump is on and a lot of water is flowing into the large tank. PD gets water from the pipe carrying it into the tank.

Filters and samples as before.

PD is taking 5 liters here. Plans to send off for Tc-99 analyses to Guy Backstrom (sp?) at DOE lab at Idaho Falls. Previously, he detected no Tc-99 here (as expected) but large levels in PB3 - larger than expected based on U and model for fission production. They will also re-sample PB3 for another (blind) analysis.

June 22, 2006

PD now bails PB3 - the "down-gradient" well on Level +0. He is obtaining several liters so as to get more Tc-99 analyses. See top of this page.

Just below Level +0, I found caliche coating the basal vitrophyre. Photos. At first I thought this could be drilling mud because a lot accumulated on Level +0 during drilling. But this is rather hard and some layers come out at fractures in the tuff.

DAP-23 Sample of the caliche shown in photos. I'm still not convinced it is not drilling mud, because it coats surface. After sampling, I am more convinced it is caliche. Tuff below the layer is darker, more purple than the exposed tuff, which has a weathered tan color.

Note: all pieces are from the same continuous layer, but pieces of substrate are included.

Not sure of relationship to pre-mining surface. About 1.5 m below Level +0. 2 peso coin in photos.

DAP-24

2 meters NE of DAP-23 and about 1 meter lower on well. This is certainly caliche because it coats fractures coming out of the outcrop. Photos.

Thin continuous layer on purple vitrophyre. All pieces from same layer. Substrate included.

KS takes GPS reading at DAP-23

↓ DAP-24 outcrop.

Check my map position against this.

GPS 038 – station #

UTM Zone 13R x = 0399319

y = 3220779

z = 1458 m

By Kevin's eyeball, sample is 2 m below Level +0. He is holding GPS about 2 m above sample DAP-23.

Next photo of larger outcrop of vitrophyre with hammer for scale. From Level -10. GPS station # 039

↓

?? GPS: 1455 m. Yes

DAP-25 GPS sta. 040

More caliche from just above Level -10, further south than 23 & 24. Tuff is reddish. Photos with 2 peso coin. Sample from single continuous layer. Up to ~ 5 mm thick. Sample includes substrate. Away from drilling mud drainage. Therefore, this sample is closest

certainly unaffected by drilling fluids

Note - there are a few more caliches uphill from the DAP-2 location (see page 3), and a little south. Exposures of tuff. Walk up gully leading up from road.

Walk there with KS.

Slickenside surface strike 081
dip 30 S
" lines rake 31° SW

DAP-26 Looks like caliche with slicks on it. Photos with coin.

Able to collect only a very small amount.

GPS sta 042 & 043.

DAP-27 ~8 meters ~SW of DAP-26. GPS Sta. 044. Caliche on fracture with orientation 030, 33 SE. Photos.

Two bags: #1 small pieces.
#2 big chunk of tuff

with one small face of caliche.

Layer is very thin. Can look at closer in lab.

KS taking average orientation of DAP-2 caliche surface (see p.3) (now DAP-28)
strike 010, dip 70 E

~~Slickenside~~ DAP 6/24/06
Slickensides on DAP-2 caliche
rake ~ 62 ~~SE~~ S DAP 6/22/06

GPS sta 045 for DAP-2

Is this really DAP-2 location? Photo.

Take new sample

DAP-28

KS: Orientation mark 356, 68 E
2-2.5" in below pre-mining surface.

February 22, 2007 DAP

Samples collected on June 22, 2006 (pp 78-81) renamed:

NOPI-DAP-23
NOPI-DAP-24
NOPI-DAP-25
NOPI-DAP-26
NOPI-DAP-27
NOPI-DAP-28

and placed in ~~a box~~ on shelf in Room L101 of Bldg 57.

Entries made in:
S:\RT Database\RT_SampleDatabase.mdb

No entries beyond this point. D.C. Peaty
2/27/2009