CNWRA #486

"Rite in the Rain"
ALL-WEATHER
Environmental
FIELD BOOK
No. 550 F

01/02

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

Notebook # 486

Return to:

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Kelly Keighley Bradbury

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2	CNWRA Bishop Tuff project Fieldbook # 486 RMF = Randy Fedors RMF 4/4/02 Other collaborators: James Evans, Craig Forster, Jason Heath, Randy Fedors Bishop Fieldtrip	7/6/01 2/02

- Summary -

Fieldwork in Bishop California and related computer analyses of the Bishop Tuff - analog for Yucca Mtn Repository Site. Fieldwork consists of fracture characterization and structural analyses to lend insight into hydrogeologic framework of Bishop Tuff.

Reference Page Index

Location USU Date 7/5/01 KKB

Project / Client

12-12:30 - Discussed project w/ jpevans
12:30-1 prep. 4 field trip gather supplies, etc.

7/6/01

6:30 a.m. - met @ jpe (Huntington) travel to airport discussion of project

10:30 a.m. pacific time arrive Las Vegas

10:30-5 Travel to Bishop

5-8 p.m. Fieldwork @ Site 1 - Quarry

→ Hydro guys from H2O Dept. of County

→ Danny, Randy - USU CNWRA, Aaron, Robert

Craig USU
Jason USU
Jim USU
Me USU

Location Quarry - Site 1 Date 7/6/01 KKB

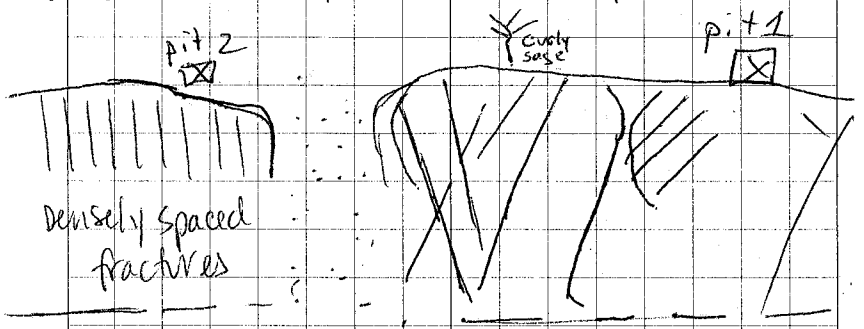
Project / Client CNWRA

Site 1 → BISHOP TUFF - BASAL Ignimbrite sequence

UTM - N: 4168238.2
E - 154854.5

cross-out okay plus 4/2/02

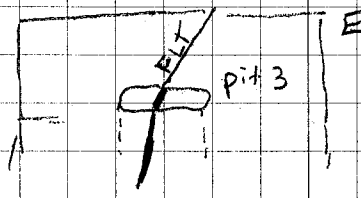
- Digital photos of Hole A, Hole B (injection)
  - ~~Hole A~~ - (pit 1) - W most pit
  - ~~Hole B~~ - (pit 2) - E most pit



E (095° = strike of outcrop face) W

* 6:56 pm Start pit 2

* 6:45 pm Start test for pit 1



Across Quarry to North from pit 1, 2

Location Quarry Site 1 Date 7/7/01 KKB

Project / Client CNWRA

FIELD OBJECTIVES OF SMUXCHAR -

1) CHARACTERIZE FRACTURE SYSTEMS
2) SAMPLE - intensely fr vs Low fr intens. + areas around hydro test pits

Trying to understand fracture genesis
- How do these fractures form in this non-welded tuff sequence -
- Why filled with caliche/calcite when formation is so porous

General observations/thoughts:

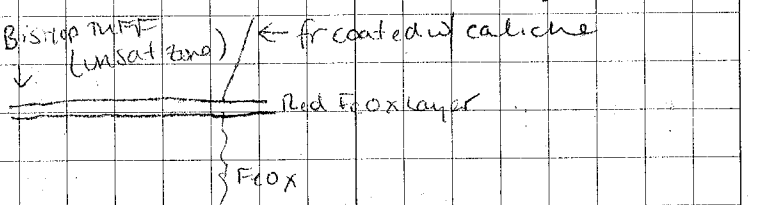
- frac filled w/ white caliche/calcite also - filled w/ red br near flt ? color of overlying Fm
  - TWO Stages of fluid flow?
- Fractures are curvilinear, some are connected in conjugate manner anastomosing sets - similar to tiny stream channels
- fractures have some thickness, (msrd) esp flts
- Lo ∠ sets cut across hi ∠ sets

Location Quarry Site 2 Date 7/7/01 KKB

Project / Client

* Constructed trace map of 3x2 m grid overlying fracture pavement
* Sampling w/ in this area - Craig, Jim (See sketch)
* 5 meter trace map of 4 wall (vertical) beneath pit #2 - Kelly measures KKB 7/7/01 Jason draws (See sketch)

HORTON Creek Site - afternoon



- H_2O percolates down & hits FeOx layer & accumulates - hence stain - finds the bit of weakness to flow down hence fingers KKB 7/7/01
  - presence of caliche below layer
- may explain observation that fractures are unfilled in ignimbrite sequence but filled in overlying tuffs

Location Horton Creek Site Date 7/7/01 KKB

Project / Client CNWRA

HORTON CREEK → FAULT

SAMPLE BT7-01

FLT (Contact) between Lacustrine & ignimbrite sequence

- 310° - Blue line indicates sample orientation

Fault - 002°/70°W

- very close to Sample BT6-01

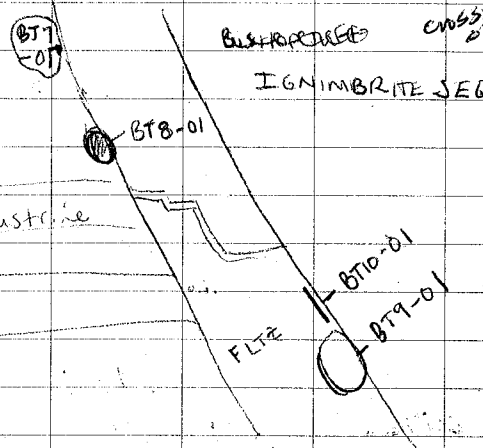
SAMPLE BT8-01 →

Slightly cemented wall in immediate HW of Fault

SAMPLE BT9-01

FLT: N/S 70° - Face opposite sample orientation line

BT10-01 - ↓ dip arrow on red surface - ⊥ to FLT (outer surface)



BUSHED ROCKS crossport okay RMF 4/4/02

IGNIMBRITE SEQUENCE

LV. 7pm

Location BISHOP Date 7/7/01 KKB

Project / Client CNWRA

BT11-01 - calcite filled fracture from pavement map @ Quarry Site 1

Meeting - Adress ?'s, issues, etc

- How does H_2O flow thru fr a fit tuff?
- Char. of Quarry material -
  - gr sz dist of nonwelded tuff
  - fr. char & how affect fluid flow
  - Yucca Mtn - N/S → extension
    - Cut by NW → NW/NE →
  - More complex, older than Bishop tuff
  - fr densities @ quarry are similar to Yucca Mtn. both $CaCO_3$ & SiO_2 Coatings found @ either
  - How significant hydrologically are fracs.

Danny has program which can analyze gr. sz distribution pati w/ consolidated rocks as well

Note - may have to take several slices in 2 Sample to minimize bias & deal

7/7/01 KKB w/ 3D distribution vs. 2D

Location Quarry Site 1 Date 7/8/01 KCRS

Project / Client CNWRA

Pit 3 ← Trimble GeoExplorer 3 GPS unit

UTM coord - {check because NOT consistent w/ Randy's readings

↓

1303 m elevation

N: 4168301.6

E: -154912.5 1304 m

MSL WGS 1984

Excavation of pit 3 → Jim, Craig, Kelly

- observe pit 2 - Finger flow - note preferential flow is between fracture surfaces

~ so frac are still exhibiting some control over the flow system -

Craig & Jim say they see the same thing with deformation bands

- frac induced anisotropy in unsat zone

Location Quarry Site 1 Date 7/08/01

Project / Client CNWRA

Back to Pavement Map of fracture swarm document sample collection w/ PHOTOS

Samples are xtrmly friable

U

↑

T 110°

76° NE

IN PHOTOS, observe - orientation of cut into sample taken

* Note blue line on frac plane

SAMPLE BT 12-01 ← EMOST T 11° 82° E → on side of sample

U

↑

T 105°

74° N

T 16° 86° E → one side of sample plane

SAMPLE BT 13-01 - WMOST SAMPLE in trench

Pit 3 -

SAMPLE BT 14-01 -

W 1/2 of block collected (see PHOTO) -

orientation is West side of Fault surface

BT 15-01 - E 1/2 of sample

Location Quarry Site 1 Date 7/8/01

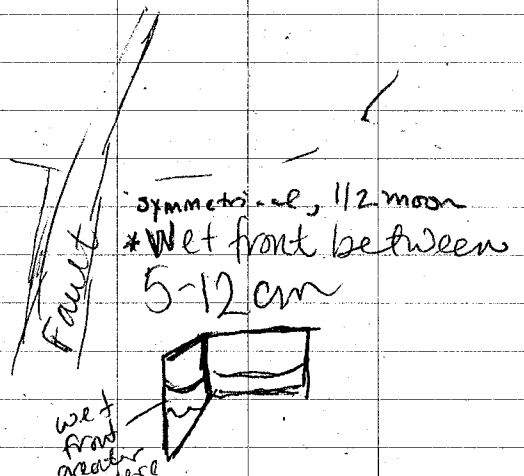
Project / Client CNWRA

BT16-01 - Fault surface epoxyed West of pit 3

BT17-01

TOP of sample is 8cm below base of pit 3 contains fault surface

Pit 3 OBSERVATIONS — @ ~15cm South of pit the dye front ~ 25cm from face



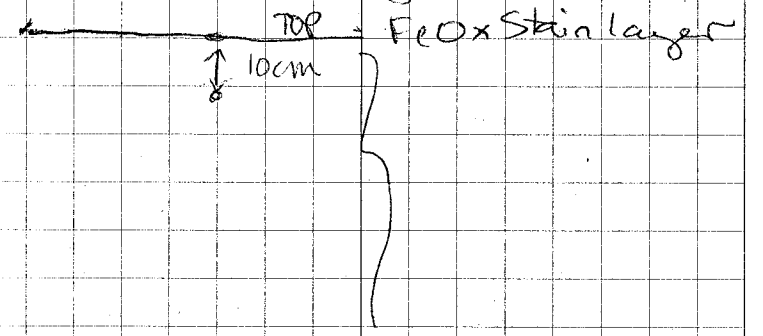
Location Horizon Creek Site Date 7/8/01

Project / Client CNWRA

w/ Craig Forester

Samples for grsz analysis - ignimbrite bed.

Sample every 10 cm



SAMPLE FROM TOP LAYER to ottetop Base ★

BT18-01 - 0-10cm
BT19-01 - 10-20
BT20-01 - 20-30
BT21-01 - 30-40
BT22-01 - 40-50
BT23-01 - 50-60
BT24-01 - 60-70
BT25-01 - 70-80
BT26-01 - 80-90
BT27-01 - 90-100
BT28-01 - 100-110
BT29-01 - 110-120

Location Horton Creek Date 7/08/01 KKP
Project / Client CNWRA - 7/09/01

BT 30-01 - part of fracture adjacent to fltz w/in HW

Site 6 - Cliff site on chalk bluffs/roads
BT 31-01 - mod welded tuff.
PHOTOS →

- purchase maps @ forest service

7/9/01 - Meet to discuss plan
Return to Site 6 -
Objectives - Run perm analysis

Site 6: UTM coord = N: 4167412.
E: -158057
Elev: 1332 m

PHOTOS - contact between mod welded / densely welded
PHOTO - test surface

* Notes for Site 6 Perm. test in Jason Heaths notebook 25-27

Location ~~KKP 7/09/01~~ Site 6 Date 7/09/01 KKP
Project / Client CNWRA

* We had trouble with perm. test 1 pump was forgotten so had to add H_2O by hand. The rate of infiltration was very high and we are slightly suspect of these results. We are running a second test in mod welded tuff.

* 2nd test was a success after much silica. It seems after sealing off Test 1 and following times the 2 tests indicate a similar result in terms of infiltration rate.

* PHOTOS OF Test 2 in mod. indurated tuff

* Infiltration rate seems higher than one would anticipate

Location Site 7 - Crucifix Date 7/9/01 ICK

Project / Client CNWRA

FAULT &

* SMALL FAULT OBSERVATIONS / mapping in BISHOP TUFF
* See Map by jpevans

UTM coordinates: WGS 1984

N: 4167257.7

E: -157719.2

elev: 1281 m

* Fault is w/in non-welded lt gray to green to white silty ash fall deposits - also see > sed. features (processes &/or evid) w/ deposit, reworking to indicate same flow

* Sampling adjacent to fault

* Jim went to Quarry & collected 2 samples
  left of pit 1 = BT32-01
  pit 2 = BT 33-01

Location Site 7 - Crucifix Date 7/9/01

Project / Client CNWRA

Crucifix Map

FW ↓

BT 34-01 - basal unit visible 3/4 cover, 19cm thick, 40cm from fltz (Horiz)

BT 35-01 - wedge 23cm thick, same unit as BT 34 gray yellowish, bounded by main flt + small flt

BT 36-01 - 15cm thick, 26 cm from fltz horiz, ASH Fall

BT 37-01 - intensely fr unit, 15cm thick, lt gray

BT 38A-01 - Flt gouge, lt gray 20cm from same bed, 1.5cm thick

38B-01 - Wt. Flt surface

BT 39-01 → 40-47cm thick * (see jpe map) med-coarser gr. tuff bdin 1.5m total seq.

BT-40-01 → coarse gr pumice unit top of sequence ~12-20cm

BT-41-01 → FLTZ - wt bed 6cm thick gouge, dragged in 2 fltz ~6 cm

BT-42-01 → wt Host Ash rock 45cm thick

BT-43-01 → FLTZ, lt gr, med-coarser, well indurated, 135cm, drag

Fltz - 20cm thick in total → N12W/84SW

Location Site 7 - Crucifix Date 7/09/01 (ICH4)

Project / Client CNWRA

FWall

BT44-01 - 73cm thick - Bdd seq ↑ wt. bdd
Sample from top of seq.
Host rock - Bdd dragged in z flt z
described in BT43-01
covered zone - see jpeg ans map + photos

BT45-01 - FLT z tan, gr flt surface
FLT = S3E/78SW
Rake = → S3E
80

From Green ASH 1 Bdd - Dist to Base of Source Bdd = 110 cm

BT46-01 — Wt ASH 1 Host
83cm thick

BT47-01 - Green ASH 1 100cm thick Host

BT-48-01 - Highly Fr. Bdd 85cm thick

HW BT-49-01 - N1E/89°S
FLT surface on HW side
DH to W/ Wt tape
Dist from source ≈ 1m
(This value has > uncertainty)

Location Crucifix - site 7 Date 7/09/01 (ICH3)

Project / Client CNWRA

(ICH3) BT-50 - flted pumice w/ calcite vein from sm flt in FW

BT-51-01 - fractured ASH green ash 1

Lightening, thunder, rain 6 p.m.

* Stopped by Lovers Quarry to determine a plan for data collection
Fault surface is only ~ 1mm - 2mm - offset is big for such small flt core

Horton Creek Site - pick up samples
Samples needed to be picked up
- BT52-01 — fracture near flt z epoxyed
- BT53-01 — Bdd pumice from hill
- BT54-01 — 1m W of dye test

Location "Loiers Quarry" - Site 8 Date 7/10/01

Project / Client CNWRA

* Jim is prep. a map of flt zone & sampling
* Jason, Kelly are running perm. tests on the poorly welded tuff sea in the Hanging wall of the flt zone
* After this site the plan is to return to Bishop & pack samples, ship + return shovel to Inyo H_2O Dept.

{Refer to Jason Heaths notebook p.- }

FLTZ = 195/74W (on Hanging wall)
196/73W

BT-55

196° ← rake
65°
80°

* 65° rake is more commonly seen

HW pink poorly welded tuff Unit B

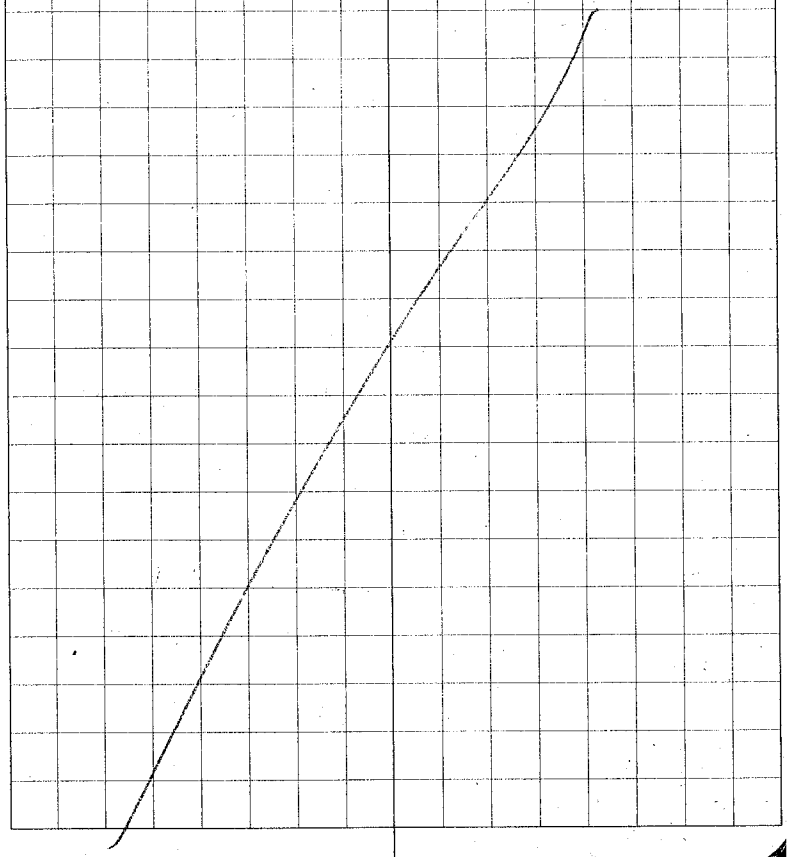
FW FLTZ buff/tan/white pumice rich non-welded

Location Site 8 Date 7/10/01

Project / Client CNWRA

Discussion w/ Jim -

* The cool thing about these flt zs in this area are that there was little to no burial - what we see is a direct example of rock deformation near the earth's surface



Location USU   Date 7/12/01

Project / Client CNWRA

1:30pm – 2:30pm

* Meet w/ Danny, Jim, Jason
  - image analysis of samples
    use program, learn – Room 148: 1st Floor - Soils

* in gene, fr. reduce perm - in unsat z
  esp. laterally
  ASK SOIL TECHS ↓ For Help:
  → Scott Jones
  → Bill Mace

TO DO:

* 1) DO GR SZ ANALYSIS OF Horton Creek site SAMPLES
  [w/o fr] Horton Creek Site & have internal porosity
  2) How to Handle fr hydrologically?
  How to deal w/ fr data -
  why fr. present?
  Density, etc?
  → xrd, xrf of fr. fill
  → Lab test - Non shear, vs. shear
  Induce fr. then run hydraulic tests
  Build set up for test
  3) Air perm.

Location USU   Date 7/23/01

Project / Client CNWRA

Meet w/ Bill Mace about Samp   2 – 3pm   7/19/01

Meet w/ Vasile   1pm   USU room 162
Working w/ particle size analysis of BISHOP TUFF samples   7/23/01

- learning Image Pro PLUS

procedure (example of standard methodology)

- Take 100g of Sample
  - take spoon - random sample
    [weigh whole bag/sample after to get rep. of lgest pt. sz]

BT-26

  - take 100g & Sieve
    a) Filter to 2mm w/ sieve
    b) bag > 2mm portion - 11.41g
    (Note some pt. longer than 2mm but thin & so sieve thru)

2mm = 89.7g

1-2 = 22.51g

    c) filter to > 1mm ≤ 2mm and bag → 66.08
    d) filter to < 1mm, refilter remains to > 0.5 mm + bag

27.37g 7/23/01

Location USU - sample analysis Date 7/23/01

Project / Client CNWRA

e) filter remains of 2.5mm 3753g
w/ 250μm sieve
250μm < sample < 0.5 mm = 21.05g

IMAGE PROPLUS - Unconsolidated Samples -

Run on BT26-01 - 72mm
↳ Icon = Image Pro 4.0
↳ turn power on Hi scope
↳ hit camera icon to reach micro (video/digital capture)
↳ get integral flash pt menu + Live preview
↳ place plate on microscope, spacing is 1mm between lines
↳ start w/ sample: take spoonful >2mm portion, hard to get all of sample in pic
{use fiber lite to add additional light}
↳ focus
↳ Hit-Snap
bt 26 _ g 2mm [BT 26 >2mm]
↳ measure - choose bright obj or dark (adjust iris at micro)
cnt/size →
↳ select msrmts
Area, Aspect, diam (max, mean, min)

Location USU - AG16C sample analysis Date 7/23/01

Project / Client CNWRA

↳ View/see msre file
↳ save as excel → 1st, 2nd 3rd snapes a, b, c dark
↳ graph in excel using Histograms, etc.

7/23/01
Next run on BT26 KKB -1-2mm
↳ we removed plate since camera is calibrated to 34x34 pixels per 1mm spacing)
↳ camera
↳ start preview
↳ Snap • bt26_12g1_a
• bt26_12g1_b
{ less than 2mm, greater than 1mm }
• bt26-12g1_c
↳ measure
cnt/size
↳ msrmts - area, aspect, diam
↳ view msre
{note - keep in mind manual separation of particle sizes when review results of program to know if they are feasible based on size}

Location USU-Ag162 Date 7/23/01

Project / Client CNWRA

↳ increase KIC B 7/23/01

↳ review photo snap and check pt sz dist based on sample - we know max, min based on sieve yet program may say max is greater as it sees part. in clump - scroll in and make sure of the limits - because they came from 1 whole pt. not a mass or edge of pt.

↳ in excel can eliminate readings that are not feasible

↳ merge several data files/snaps to get final mean graph
3 ~ 4 samples per workshore ~ 3 to 4 graphs
Avg - Bin Aspect, Bin diameter -
0.5 , 0.1

inexcel

↳ put BT26-01 → 12g1 a, b, c
re-sort by diameter inexcel
for each snap a, b, c

Location USU Date 7/23/01

Project / Client CNWRA

↳ sort descending diameter

↳ pick range based on analysis of photo

↳ TOOLS > data > Histogram
Analysis
input range - highlight column, rows of interest (mean diam)

↳ copy n paste mean diam for ea into avg sheet

↳ make Histogram
CHOOSE desired Bin range
↳ graph. input, output range
↳ get Bin, Frequency
↳ plot as % of sample in bag and then we can apply this to weighted % dist from sieve

Plan → meet Wed → 10a.m. 7/25

↳ sep. samples w/ sieves
>2mm ✓
1-2mm ✓
<1mm
0.5-1mm ✓
<0.5mm

Location USU - Ag 162 Date 7/25/01

Project / Client CNWRA

10:15 a.m. → met Visale for sample analysis
begin PHOTOSnaps of samples

Idea?

- maybe try thin sections in this analysis - for gr sz dist in consolidated materials - could get real nice imagery of xl struc, welding

ALSO: For pt sz dist, in report have photo adjacent to graphs

Next Step(s):

- Sieve BT18 - BT29 from Horton Creek Site - [12 samples] → 5 bags ea 3 runs/bag
- Image pro analysis for ea. → 90 runs/3 days

Location USU - Ag Date 7/25/01

Project / Client CNWRA

BT18-01

- Weigh out sample = 341.5 g
- Separate = >4mm = 108.6 g
  [<4mm = 230.7 g
  >2mm = 55.2 g
  1mm < BT18 < 2mm = 90.5 g
  250 μm < BT18 < 0.5mm = 24.6 g
  1m 0.5 < x < 1mm = 47.2 g
  250 μm > 8.7 g

230.7
55.2
285.9

BT19-01

- 355.75 g
  9.48 g wt. of baggie

346.27 g

230.7
- 55.2
175.5

7/25/01
>4mm = 67.4 g
2mm < BT19 < 4mm = 67 g
1m < .. < 2mm = 102.3 g
= 69.7 g
0.5 < .. < 1mm
250 μm < .. < 0.5mm = 18.3 g
< 250 μm = 8.7 g

Location USU Date 7/25/01 (CLW)

Project / Client CNWRA

BT20-01

wt = 358.05g

Baggiewt = 9.45g

Total wt = 348.60

>4mm = 98.8g

2< <4mm = 70.5g

1< <2mm = 92.8g

0.5< <1mm = 54.9g

250μm< <0.5mm = 14.1g

<250μm = 12.8g

BT21-01

449.22g

Baggie = 8.76g

Total wt =

>4mm = 75.2g

2< <4mm = 75.3g

1< <2mm = 148g

0.5< <1mm = 90.8g

250μm< <0.5mm = 26.8g

<250μm = 14.5g

Location USU Date 7/25/01

Project / Client CNWRA

BT22-01

wt = 498.56g

baggie = 9.21g

>4mm = 68.4g

2< <4mm = 54.9g

1< <2mm = 178.2g

0.5< <1mm = 135.5g

250μm< <0.5mm = 30.6g

<250μm = 3.0g

BT23-01

wt = 393.21g

baggie = 9.21

Total = 384.0g

>4mm = 64.8g

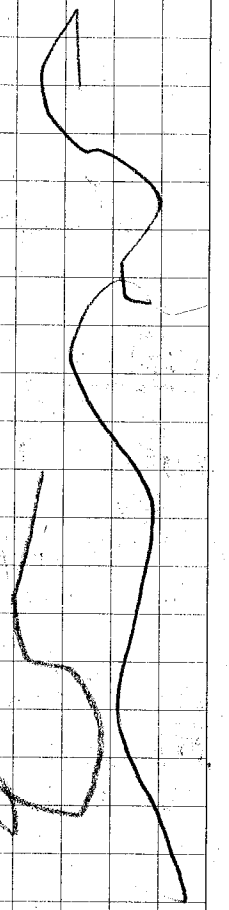
2< <4mm = 55.6g

1< <2mm = 112.2g

0.5< <1mm = 97.1g

250< <0.5 = 35.3g

<250μm = 17.0g



Location USU – Ag Date 7/25/01 KCB

Project / Client CNWRA

BT24-01

- 469.21g

bagg'c = 8.8g

Total 460.41g KCB

>4mm = 54.0g

2 < < 4mm = 64.1g

1 < < 2mm = 140.9g

0.5 < < 1mm = 114.2g

250μm < < 0.5mm = 61.2g

< 250μm = 18.8g

BT25-01

- 429.25g

bagg'c = 9.44g

Total =

>4mm = 59.5g

2 < < 4mm = 46.1g

1 < < 2mm = 99.8g

0.5 < < 1mm = 105.6g

250μm < < 0.5mm = 71.5g

< 250μm = 37.8g

Location USU – Ag Date 7/25/01 KCB

Project / Client CNWRA

BT27-01

- 541.88g

bagg = 9.36

Total =

>4mm = 38.2g

2 < < 4mm = 40.8g

1 < < 2mm = 121.6g

0.5 < < 1mm = 160.2g

250μm < < 0.5mm = 126.0g

< 250μm = 40.8g

BT28-01

- 458.67g

- bag = 9.55g

Total

> 4mm = 46.9g

2 < < 4mm = 38.1g

1 < < 2mm = 110.7g

0.5 < < 1mm = 138.4g

250μm < < 0.5mm = 76.8g

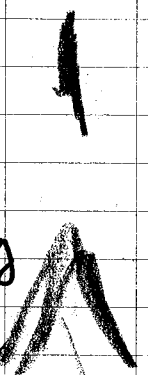
< 250μm = 31.9g

Location USU-Ag Date 7/25/01

Project / Client CNWRA

BT29-01

wt = 548.06 g
bag = 9.47g
TOTAL =
>4mm = 84.0g
2 L < 4mm = 39.9g
1 L < 2mm = 121.7g
0.5 L < 1mm = 166.7g
250μm < < 0.5mm = 84g
< 250 μm = 34.8g



END 4 DAY → 3:45 pm

*Meet Vesile on Friday 2:15pm 7/27/01

PHOTO IMAGES OF BISHOP SAMPLES = Files

- BT18 - >4mm BT18_g4a,b,c
- BT18 - 2-4mm BT18_g2l4 a,b,c
- BT18 - 1-2mm BT18_g1l2a,b,c
- BT18 -0.5-1mm BT18_g05l1a,b,c
- BT18 250μm-0.5mm BT18_g250l05a,b,c
- BT18 <250μm BT18_l250a,b,c

Location USU-Ag Date 7/27/01

Project / Client CNWRA

BT19-01

- bt19 >4mm = bt19_g4a,b,c
- bt19 2-4mm = bt19_g2l4a,b,c
- bt19 1-2 = bt19_g1l2a,b,c
- bt19 0.5-1 = bt19_g05l1a,b,c
- bt19 g250-l0.5 = bt19_g250l05a,b,c
- b19 l250 μm = b19_l250a,b,c

BT20-01

- BT20 >4mm → Bt20_g4a,b,c
- BT20 2-4mm → Bt20_g2l4a,b,c
- BT20 1-2mm → Bt20_g1l2a,b,c
- BT20 0.5-1mm → Bt20_g05l1a,b,c
- BT20 250μm-0.5mm → Bt20_g250l05a,b,c
- BT20 <250μm → Bt20_l250a,b,c

Start w/ images 2:30 -

BT21-01

- BT21 >4mm → Bt21_g4a,b,c
- BT21 2-4mm → BT21_g2l4a,b,c
- BT21 1-2mm → BT21_g1l2a,b,c
- BT21 0.5-1mm = BT21_g05l1a,b,c
- BT21 250μm-0.5mm = BT21_g250l05a,b,c
- BT21 <250μm - BT21_l250a,b,c

Location USU Date 7/30/01

Project / Client CNWRA

BT22-01

- BT22 >4mm – BT22_g4a,b,c
- BT22 2-4mm – BT22_g2l4a,b,c
- BT22 1-2mm – BT22_g1l2a,b,c
- BT22 0.5-1mm – BT22_g05l1a,b,c
- BT22 250μm-0.5mm – BT22_g250l05a,b,c
- BT22 <250μm – BT22_l250a,b,c

end @ 4:45pm.

BT23-01 3:15pm – 5p.m. 8/1/01

- BT23 >4mm – BT23_g4a,b,c
- BT23 2-4mm – BT23_g2l4a,b,c
- BT23 1-2mm – BT23_g1l2a,b,c
- BT23 0.5-1mm – BT23_g05l1a,b,c
- BT23 250μm-0.5mm – BT23_g250l05a,b,c
- BT23 <250μm – BT23_l250a,b,c

BT24-01

- BT24 >4mm –
- BT24 2-4mm –
- BT24 1-2mm –
- BT24 0.5-1mm –
- BT24 250μm-0.5 –
- BT24 <250μm –

Location USU Date 7/30/01 – 8/8/01 KCB

Project / Client CNWRA

8/1/01

* CRUSH BISHOP TUFF Crucifix Faults Site samples 5-6 p.m.

8/3/01 – PHOTO BT25 – BT27

8/6/01

CRUSH, XRD BISHOP TUFF – Crucifix Site

8/7/01 – XRD " "

– PHOTO BT28 – BT29

~~– Refer~~ KCB Fr gr sz analysis 8/7/01

8/8/01 – XRD Bishop Samples

Epoxy of BT samples – put cross-cut oil on 4/11/02 curing KCB

- 10 pt. resin to 1 pt agent
- Blue-Dye – end of tip full
- fill cups to 15mL w/ resin to 1.5mL of curing agent (throw away ea cup after 1 use)
- Stir w/ rod – 2 ple min

Location USU Date 8/8/01

Project / Client CNWRA

Generally,

- Leave in vacuum about 2hr ~ then expoy again probably need to do this ≥4x
- when done, no more expoy soaks in - it pools on surface.
- Place in new tray place in oven for 3-4 Hours to Harden expoxy
- when finished - slice & put together thin section request.

Next to Epoxy →

✓ ① BT 601 - or BT 601
✓ ② BT 31-01
③ BT 55-01 - make a bunch of expoy w/ dixie cups
④ BT 801 - expoxy only
⑤ BT-701 - " "
⑥ BT-10-01
⑦ BT-901
✓ ⑧ BT-50a

Location USU Date

Project / Client CNWRA

KLCB

8/9/01 -
crush samples, Epoxy
run xrd

8/13/01 -
Epoxy samples
Run xrd - finish for
Crucifix fit

* Samples placed in oven @ 1:30pm → go to ~5

create Sample inventory sheet in Word

8/14/01 -
start epoxy run @ 12:45
till (~2:45)
3p.m. Final Run for Chamber 2 (old vacuum)
→ 5p.m. 2nd Run Chamber 1 (new vacuum)
9p.m. - stop

8/15/01 • 9:30a.m. - Samples in oven
• 3rd Run for Samples in New Vacuum

Location USU → Date 8/15/01

Project / Client CNWRA

BT 10-01 - ADD to old chamber @ 12:15 pm (1st Run)

BT-7-01 ADD more epoxy @ (2nd 2m)

2:45 pm - ADD more epoxy to both chambers

5 pm → Epoxy both chambers last run for old chamber (Samples BT-8, BT-9)

* Samples BT-6, BT-31 complete and taken out of oven

8/16/01

10:00 a.m. - inventory w/ jpe

10:20 a.m. Samples BT-8, BT-9 put in oven
- Run BT-7, BT-10 (4th run) @ 10:35
- FLIP SAMPLES @ 12:30 pm

Location USU Date 8/15/01 - 8/20/01

Project / Client CNWRA

8/16/01

BT12
BT13
BT14
BT15
BT17
BT55 — Run IC Tests on these

thin section & to ECT
- epoxy only part in order to IC tests

Samples to work w/ Bill Mace on doing IC tests
→ need to put tubes in 2 more try for both horiz and vert. msrmts.

Meet w/ Bill = ~~MONDAY~~ WED. Aug 22 @ 9 am

cross-out okay RMF 4/4/02

8/20/01 -

* Saving photos of grain analysis and measuring grain char - note - having trouble getting Image Pro to count objects as we see - ask Vasile about
* bt18 g/126

Location USU Date 8/22/01

Project / Client CANWRA

4am • Sample prep for Thin Section

Meet w/ Bill Mace 9:30 am

* Trying to figure out how to treat samples in order to preserve their qualities for a sat. cond. test.

* Options -
  - perform soils sat test and take sieve L to 2mm - compare qual
  - try drill w/ serrated bit into sample - sample as column, hope it holds to perform tests
  - Need to talk w/ Danny & Jim to det. next steps & how they would like to handle it.

Location USU Date 8/23/01

Project / Client CANWRA

KRB

* 7am - Work on edit of figs for trip Report 2

* Calculations to test for smear potential

-12 noon

PWF for KRB 4/4/02

8/26/01

Figures for Trip Report 3

12 - 4 pm

PWF for KRB 4/4/02

8/27

Figures for trip report 3

9 - 4

Location USU Date 8/28

Project / Client CNWRA

8/28/01

RWF for KKB 9/4/02

Fig for trip Report

Sample prep - epoxy

1st rm - BT-55 put in chamber @ 4pm

RWF for KKB 9/4/02

8/29/01

Bishop Samples

BT-55

epoxy + rum second time @ 12:30 p.m.

- 4pm

Location USU Date 8/29/01

Project / Client CNWRA 9/5/01

KKB

epoxy of samples - BT-

- xrd analysis begins on samples BT34 - BT57
- clay smear analysis
- calculations for Bzune 8 style #

use yielding paper 1997 to calculate - CSP
SF
SSF
SBR%

refer to file: BT calculations on personal Mac

Location USU Date 9/8 9/9

Project / Client CNWRA

9/8/01

Sept 8th - RWF for KKB 4/4/02
12-5
Bishop Data analysis for Cuesta fault

9/10/01

Mon Sept 10th RWF for KKB 4/4/02
Bishop Data analysis
Epoxy +
Run samples for
3rd time
@ 12:30pm
- 4:30pm

Location USU Date 9/11

Project / Client KKB

9/11/01

Tues Sept 11th RWF for KKB 4/4/02
Epoxy BT-55
for 4th (last) RUN
10:30 a.m.
Run all day

9/12/01

Wed Sept 12th RWF for KKB 4/4/02
12 noon - put BT-55
in oven
Bishop Trip Report
Figure 8.
oven off @ 5:15pm

Location USU Date 9/13/01 9/14

Project / Client CNURA

9/13/01

Thurs Sept 13th

RWF for KKB 4/4/02

* report 3 readings fig. 8-illustration

* xrd analysis

9/14/01

RWF for KKB 4/4/02

14th

9 am

Begin slicing rocks for thin sectoral analyses

- some rocks need to be re-epoxyed due to problems w/vacuum

11:30 am

* Xrd analysis - meet w/ ~~Joe~~ pete Kolesar to discuss proper analysis techniques & mineralogy questions

Location USU Date 9/14/01

Project / Client CNURA

ICUS

THIN SECTION PREP →

BT 30 - prep for thin section complete
BT 53 - prep for T.S. complete
BT 50a - " "
50b - " "
50c - " "
BT 16a - filtric - } samples need more epoxy
16b -
16c -

While cutting samples ... several will need more epoxy - once H_2O hits sample from saw blade it is evident that not enough epoxy entered sample this is likely a result of problems w/ vacuum seal (see pg 46) vacuum seal is fixed 9/14/01

Location USU Date 9/17/01

Project / Client CNWRA

RWF for KKB 4/4/02

* Figure 8

* Bishop Samples -
Cut & re-epoxy
1st run - 9am
Samples - BT32, BT7,

BT1 - prep for T.S. complete
BT4 - prep for T.S. complete
BT5 - prep for T.S. complete
BT52 - add more epoxy

Location USU Date 9/18 9/20 9/21

Project / Client CNWRA KKB 9/21/01

Bishop XRD analysis

• NOT easy to make sure minis in comp files match overlays of files

5/D - ① Qtz, = red (SiO_2)
② Albite, Ca, ordered (Na, Ca) Al (SiO_2)
= lt green
KKB 9/21/01 ~~③ Albite, ordered Ca Si O8~~
③ Anorthite, Na disordered = Ca, Na
= deep blue
④ Microcline = $KAlSi_3O_8$
= gray

5/C → SAV
5/B → SAV
5/A → SAV

* PLOT ~~BT-51~~ KKB 9/21/01 BT-51 together as 5/a - minis in Band
5/b - minis outside

TOTAL PDF ID =
① Qtz
② Albite, ordered
③ Anorthite, Na ordered
④ Anorthite, Na, int
⑤ Albite, Ca ordered
⑥ Anorthite ordered
⑦ Anorthite Na disordered
⑧ Microcline, ordered

Location USU Date 9/21/01

Project / Client CHARM

50A - ✓Qtz
✓Albite ordered
✓Anorthite, Na ord.
✓Calcite
✓Anorthite, Na int
✓Albite, ord (repeat

50B - ✓Anorthite, Na int
✓Qtz
✓Albite, ordered
✓Anorthite, Na ord.
✓Calcite
✓Anorthite, Na int (repeat)

50C - ✓Anorthite, Na int
✓Qtz
✓Albite, ordered
✓Anorthite, Na ordered
✓Calcite

PLOTS 50-01-minsio in plot
50x-01-Minls in own
Bands below
plot

Location USU Date 9/21/01

Project / Client CHARM

KLB

49 - see plot
48 - " "
47 " "
46 " "
45 " "
44 " "

9/21/01

overlap { 43A → Qtz, Calcite, Alb Anorthite, Na int, ord
43B → Qtz

42 → Lots of glass - amorphous curve between 20°-30°
Qtz
Anorthite, Na ordered
Anorthite Na int

41 → Qtz
microcline ord.
Anorthite Na int
Anorthite Na ord

40 → Qtz
Anorth, Na ord
Anorth, Na int

Location USU Date 9/21/01

Project / Client CNWRA

BT39 → Qtz, Anorthite Na ord
Na int

BT38A → Calcite
38B → Qtz

BT37 → Calcite
Qtz
orthoclase

BT36 → Anorthite, Na ord
Albite, ordered
Qtz

BT35 → Albite-ord
Anorthite, Na ord
Anorthite, int
Microcline, ord

BT34 → Qtz
anorth Na int
albite ord
anorth Na ord

Location USU Date 9/22/01

Project / Client CNWRA KHB

XRD Analysis on computer at USU - files are BT#.sav or .cpi

PLOTS w/ "X" after sample name in file indicate each mineral phase is separated underneath the PLOTS of signatures

* several PLOTS SHOW AMORPHOUS or glassy material in abundance

9/23-9/25

* most common minerals are Quartz

RWF for KHB 4/4/02

* Would expect zeolites but they are not showing up on xrd analysis might need to do clay slurry of fines to find clay, zeolites

Location USU Date 10/1/01

Project / Client CNWRA

KLB

* pc files of xrd analysis saved and imported as TIFs into mac - (laptop) new xrd images are saved as:
BT34xrd to BT51xrd

* email Theres figures to Jpg by Wed. along w/ figure 8 for trip report ✓

Location USU Date 10/3/01

Project / Client CNWRA

KLB

10:30 a.m.
meet w/ Dani Or & Bill Mace to discuss samples they need for soils tests

THIN SECTION PREP -
Run BT-32 (2nd time) re-epoxy
Run BT-33 (1st time) epoxy
Run BT-7 (2nd time) re-epoxy
Run BT-6 " "

11:30 /12 10/3/01
meet w Bill, [redacted] KLB
give him BT-29-01
to run tests - he will re-combine sieved sample

▼ NOTEBOOK COPIES MAILED TO RANDY 10/3/01 → research will continue w/ this notebook hard copy K.L. Bradbury

Location USU Date 10/3 - 10/11

Project / Client CNWRA

KKB

10/5/01

Save msrm. files for grain size analysis samples BT-18 BT-26 ↓ 10/7

Work on exporting into excel files & creating graphs based on weight of sample

Save under:

BT18-folder

msre data

BT18.xls (overall file from all grain size divisions)

RWF for KKB 4/4/02

10/11

- Received email w/ trip rep. attachment from Joe Pritchett

Location USU Date 10/12/01

Project / Client CNWRA

KKB

BT-epoxy 9am

Run - BT-7 (3rd time)
- BT-6

BT-32 (3rd time)
- BT-33 (2nd time)

RWF for KKB 4/4/02

10/15/01

11a.m.

BT-6 - Bake in oven
-7 - Epoxy #4
-32 - Bake in oven
-33 - Bake in oven
-16C - Run #1 - vaccum
a) face cut // to strike
b) face cut ⊥ to strike

Location USU Date 10/16/01

Project / Client KKB

10:15 am

Epoxy Samples -
BT-7 - add to balce
BT-16C - Run #2 vaccum
for both // & ⊥ to strike cuts
BT-10 - Run #1 vaccum
re-epoxy

Turn down off @ 4:15 p.m.

Run for KKB 4/4/02

10/17

Talk w/ Craig F. about Large samples
He suggests we take X-rays before
we test → call vet. clinics

10/18 Run for KKB 4/4/02

Call USU vet dept - unable
to track & xray machines

10/19 Run for KKB 4/4/02

call local vets to ask if
we can xray rocks -
Still waiting on response
from Dr.'s

Location USU Date 10/21/01

Project / Client KKB

9:30 am
epoxy samples
BT-16-C - Run #3 // & ⊥ cuts

BT-16-B - Run #1
⊥ to strike ?
(check again - sample may not be oriented)

* Epoxy w/ QUICK hardner by RdKa (very fast)
on samples - Last epoxy by slice
BT-33-01
BT-32-01
BT-10-01
BT-7-01
B-6-01

Run for KKB 4/4/02

10/22
epoxy runs (cont.)
BT-16C #4
BT-16B #2

Location USU Date 10/23/01 KKB

Project / Client CNWRA → 10/26 (2001) RMF 4/4/02

Samples → abundant porosity
Samples are taking in large amounts of epoxy - yet still not seeing "pudding" of epoxy on top of sample cuts - which usually tells us sample is done & its time to bake
10/24
RMF for KKB 4/4/02

epoxy runs
BT 16C → #5
16B → #2

NOTE: impermbarrier holds
Cut BT-7 → blue dye epoxy & moves to edges - need to epoxy after slicing 10/26
RMF for KKB 4/4/02

epoxy
BT-16C → #6
-16B → #3
16A → #1
BT-031 → #1 re epoxy

Location USU Date

Project / Client CNWRA KKB

10/26
2001
RMF
4/4/02

- Run epoxys tie 4pm -

RMF for KKB 4/4/02
(2001) 10/29
Run epoxy am (tie 3pm)
→ 16-A - #2
→ BT-31 - #2
→ 16B - #4.

re epoxy again
16-A - #3
BT 31 - #3
16B - #5
BT #7 - re epoxy cut surface

10/30
16A, 31, 16B, 7 in oven
12:30pm

(2001) RMF for KKB 4/4/02

Location Logan USU Date 10/29/01

Project / Client CNWRA KKB

* Reed Nilson - USU
Ind. Tech
X-ray machine

2001 → 10/30 RWF for KKB 4/4/02

re epoxy - slice samples 1:15pm

BT-9 → re epoxy

BT-53 →

BT-52 →

BT-8 →

vacuum til
10/31

see page 67

Location USU CNWRA Date 10/30

Project / Client KKB

Walk in 10/30/01
Vasile/Mike (Dani OR staff)
Offices
⇓

Measurement data → for all samples that took gray photos of - BT19 - BT-29
[BT-18 - files in excel]

we more/scan w/ siz analysis
→ eliminate sizes that are not feasible for pic based on sieve analysis

Measurement Data → free file
→ Area
Aspect
Diameter (max)
Diameter (mean)
Diameter (min)
Roundness
Size (length)
Size (width)

Calib @ 34 pixels/mm Pen test KKB

Location USU
Project / Client CNWRA
Date 10/30/01
Revs for KKB 2/4/02

→ View → Statistics

Count/Size

manual → select colors ← KKB 10/30

* Trying to learn ImagePro program — to get all size pt in image wanted — this is problem — program is only calling 230 of pt.

* Select range of intensity under manual check aspects, etc to see if feasible — average from 3 images per sample → average for one sample bag → then avg. for all (2 ←

* always use max or min/min. diameter of sieve —

Location USU
Project / Client CNWRA
Date 10/31/01
KKB

10/31/01

BISHOP → epoxy samples
BT-9 → 2nd run 11a.m.
-53
-52
-8

on USERS - Kelly 10/31/01

BT-19 → save as xcel files on zip-brs-Analysis Folders

bt19-1250c - 1250c.xls ✓
bt19-1250b - 1250b.xls ✓
bt19-1250a - 1250a.xls ✓ okay pwd 2/4/02
bt19-g250105c - g250105c.xls ✓
bt19-g250105b - g250105b.xls ✓
bt19-g250105a - g250105a.xls ✓
bt19 g0511c - g0511c.xls ✓
bt19-g0512b - g0511b.xls ✓
bt19-g0511a - g0511a.xls ✓
bt19-g1L2c - g1L2c.xls
bt19-g1L2b - g1L2b.xls
bt19-g1L2a - g1L2a.xls
bt19-g2L4c - g2L4c.xls
(≈ 15-16 grains)

Location USU Date 10/3/101

Project / Client CNWRA

* Look @ Aspect ratio to pick out lines from scale plate
  → these are showing up as objects when we count
* Count grains on Lg Sz particle photos to make sure count f(x) is realistic KKB 10/3/101
* Aspect ratios should be very low for these rand particle sizes

BT-19 (cont.) OKam RWF 4/4/02

savedfiles

bt19g2l4b.xls (~20grains)
bt19g2l4a.xls (~24grains)
bt19g4c.xls → g4c.tif
b19g4b.xls → g4b.tif
b19g4a.xls → g4a.tif

not counting accurate

Explain →
We will save photos - insert mean diameter from photo

See in photo = || = division on plate = 1mm

Location USU Date 10/3/101

Project / Client CNWRA

KKB 11/01/01

Thin section prep

BT-55 - cer-epoxy
BT-54 -
BT-8 -
Vacuum ~ 12 micron

BT-7 - Balce @ 10a.m
BT-53 -
B-52 -
BT-9 -
16-C - // & ⊥ to strike

need to epox 1/m-1
1/m-2
Before send off to T.S. for analog comp.

Location USU Date 11/01/01

Project / Client CNWRA KLB

grsz analysis - imagefiles - Bt-20

bt20 g05l1a -	g05l1a.xls
" " b -	g05l1b.xls
" " c -	g05l1c.xls
bt20 g1l2a -	g1l2a.xls
" " b -	g1l2b.xls
" " c -	g1l2c.xls
Bt20 g250l05a -	g250l05a.xls
" " b -	g250l05b.xls
" " c -	g250l05c.xls
Bt20 g2l4a -	g2l4.xls ~[32 grains]
" " b -	g2l4b.xls ~[29 grains]
" " c -	g2l4c.xls [28 grains]
bt20 l250a -	l250a.xls
l250b -	l250b.xls
l250c -	l250c.xls
bt20 - g4a -	g4a.TIFF [save PHOTO]
g4b -	g4b.TIFF
g4c -	g4c.TIFF

Location USU Date 11/01/01

Project / Client CNWRA

BT 21-01

bt21 g05l1a -	g05l1a.xls
" " b -	g05l1b.xls
" " c -	g05l1c.xls
bt21 g1l2a -	g1l2a.xls
" " b -	g1l2b.xls [saved as c.]
" " c -	g1l2c. [saved as b.]
bt21 g250l05a -	g250l05a.xls
g250l05b -	g250l05b.xls
g250l05c -	g250l05c.xls
bt21 g2l4a -	g2l4a.xls [18gr]
" " b -	g2l4b.xls [18gr]
c -	[18gr]
bt21 l250a -	l250a.xls
b -	l250b.xls
c -	l250c.
bt21 g4a -	g4a.TIFF
b -	g4b.TIFF
c -	g4c.TIFF

Fix

Location: USU Date: 11/01/01

Project / Client: CNWRA

KRB

BT 22-01

BT22-g05l1a - g05l1a.xls
g05l1b.xls
g05l1c.xls

BT22-g1l2a - g1l2a.xls
b - g1l2b.xls
c - g1l2c.xls

Bt 22-g250l05a g250l05a.xls
" " g250l05b.xls
" " g250l05c.xls
" "

bt 22-g2l4a - g2l4a.xls [20gr]
b - g2l4b.xls [19gr]
c - g2l4c.xls [20gr]

bt22-l250a - l250a.xls
l250b - l250b.xls
l250c - l250c.xls

bt22 g4a - g4a.TIFF
b - g4b.TIFF
c - g4c.TIFF

Location: USU Date: 11/01/01

Project / Client: CNWRA

KRB

BT-18 - need to add to zip

- g1l2b → ✓
- g2l4a → ✓ [49gr]
  b → ✓ [37gr]
  c → ✓ [37gr]
- g4 (save as TIFFs)
  4a →
  4b →
  4c →

can copy & paste graph into diff files - Right click - Change source data -

xcel files - BT-18 g05l1. a,b,c
0.5-1 mm pt = g05l1.xls

1) sorting by Diam (max)
2) pick only those values ~1 - 0.5 to plot in graphs
3) Bin data in 0.01 →

Location USU Date 11/01/01

Project / Client CNWRA KRB

Select → Tools

→ Histogram

↓

Bin / frequency

↓

4) averaging all 3

Bin – avg

5) * add all in 3 rows double click under 1st avg # to copy to whole column

6) BT18 gosel

Total $\Sigma_1 = 19$

$= 100\%$

7) copy graph – right click source data ☺ in new file

Location USU Date 11/01/01

Project / Client CNWRA KRB

8) avg – for ea sample sz (e.g. <250 μm)

9) freq → (% × wt% of sample)

X <250 / 250-05 / 05-1 / 1-2 / 2-4 / = Bin Size (0.01)

KRB 11/01/01

x_1 x_2 y_3 y_4 4

10) put all in 1 column → 0

X: 0 (0.01 Bin) ↓ 4

Y: % (avg)

graph e.g. = TOTAL sample

Location USU Date 11/01/01

Project / Client CNWRA KKB

BT-23-01

BT-23g05l1 - g05l1a.xls
b.xls
c.xls

BT-23g1l2a - g1l2a.xls
b.xls
c.xls

BT-23g250l05a - g250l05.a.xls
g250l05b.xls
g250l05c.xls

Bt-23 g2l4a - g2l4a.xls [1kg5]
b - KKB 11/1
c -

l250a - g l250a.xls
b - KKB 11/1 l250b.xls
c l250c.xls

program is comin up w/ Diam L2

plan - cont on small gr files for now til figure out errors

Location USU Date 11/1/01

Project / Client CNWRA KKB

34 pixels - multiply in excel 21/34 by diameter to get true (but photos set for 21)

→ 24-29 (still scan more data)
Focus on gr sz ∠2 mm
B4 leave for col.

RWF for KKB 4/4/02

11/2/01

BT-24

g05l1a - g05l1a.xls
b - g05l1b.xls
c - g05l1c.xls
g250l05a - g250l05a.xls
b - g250l05b.xls
c - g250l05c.xls

* Now set → @ 34

l250a - l250a.xls
b - l250b.xls
c - l250c.xls

BT-25-01

g05l1a → g05l1a.xls
→ g05l1b.xls
→ g05l1c.xls
g250l05a - g250l05a.xls
b - g250l05b.xls
c - g250l05c.xls

Location USU Date 11/2/01

Project / Client CNWRA

ICRB

BT-25-01 (cont)

l250a – l250a.xls
l250b.xls
l250c.xls

BT-26-01

g05l1a – g05l1a.xls
b – g05l1b.xls
c – g05l1c.xls

g250 l05a – g250l05a.xls
b – g250l05b.xls
c – g250l05c.xls

l250a – l250a.xls
ICKB b – l250b.xls
11/2 c – l250c.xls

Location USU Date 11/3/01

Project / Client CNWRA

ICKB

Bishop Thin Sections
epoxy → continues

Xcel files for br sz analysis measurements – re photo & measure for ∠ 2mm @ 34 pixels / mm

Bt18g4.jpg – save as xcel files
Bt18g2l4a – 3.1 ↓ starts good data
Bt18g2l2a – 2.1 ↓ starts good data
ICKB 11/3/01

Bt18g4b – data good 8.537 – 4.152
except 7.773

Bt18g4c – data good from 4.85 to 2.301
data good from 7.26 to 3.76

Bt18g2l4b –

Bt18g2l4c – data good from 5.88 to 3.13
except 4.638

Location USU Date 11/4/01

Project / Client CNWRA KKB

Xcel files

√ Bt18g1l2b - data good from 1.984

√ Bt18g1l2c - data good from 1.988 to 1.048

Bt19g4a - data good from 8.85 to 6.30

Bt19g4b - good from 8.059 to 4.876

Bt19g4c - good from 7.50 to 4.68

Bt19g2l4a - data good from KKB 11/4/01 6.07 to 2.64

Bt19g2l4b - data good from 4.63 to 2.15

Bt19g2l4c - data good from 5.287 to 2.140

Location USU Date 11/5/01

Project / Client CNWRA KKB

Xcel files

Bt19g1l2a - data good from 1.96 to 1.07

Bt19g1l2b - data good from 1.98 to 0.91

Bt19g1l2c - data good from 1.988 to 1.095

Bt20g4a - data good from 8.17 to 5.15

Bt20g4b - data good from 6.71 to 4.76

Bt20g4c - data good from 10.398 to 5.126

Location USU Date 11/6/01

Project / Client CNWRA

KKB

Data good:

BT20g2l4a - → 5.180 - 3.057

BT20g2l4b - " " 6.33 - 2.57

BT20g2l4c - " " 5.49 - 2.96

BT20g1l2a - " " 1.95 - 1.02

BT20g1l2b - " " 1.99 - 0.99

Bt20g1l2c - " " 1.93 to 1.04

BT21g4a - " " KKB 11/6 9.31 to 4.88

BT21g4b " " 8.6 to 4.4 2001? RMF 4/4/02

BT21g4c " " 8.5 to 4.3

BT21g2l4a - " " 6.4 - 2.8

BT21g2l4b " " 6.4 - 2.3

BT21g2l4c " " 4.77 to 2.56

Location: USU Date 11/7/01

Project / Client CNWRA

KKB

Bt21g1l2a - data good from 1.97 to 0.98 except 1.08

Bt21g1l2b - data good from 1.94 to 1.00 except 1.24 & 1.064794

Bt21g1l2c - data good from 1.99 to 1.0

Bt22g4a - data good from 8.7 to 4.6

Bt22g4b - data good from 10.5 to 4.0

Bt22g4c - data good from 15.06 to 4.65

Bt22g2l4a - data good from 4.83 to 2.49

BT22g2l4b - 5.989 - 2.246 except 4.409

BT22g2l4c - 4.86 - 2.39 except 4.85

Location USU Date 11/08/01
Project / Client CNWRA 11/09
KKB

BT22g12a - " " 1.8 - 1.05

Bt 22g12b - 1.77 - 0.91
except 1.25

Bt 22g12c - 2.39 to 1.04
plus 3.13
3.12
2.94
2.73
2.57
2.52
2.43
except 2.11 (#164)
1.571
1.28
1.09

BT23g4a - data good from
8.69 to 4.96
except 5.39

Location USU Date 11/09/01
Project / Client CNWRA
KKB

BT 23g4b - data from
9.4 to 4.76

BT 23g4c - data good from
11.0 to 6.7

BT 23g2l4a - 5.979 to
2.18

BT 23g2l4b - 5.25 to
2.185

Bt 23g2l4c - 6.61 to 2.176
except 5.28

Bt 23g1l2a - 1.839 to 1.02
except 1.35 ; 1.30 (#154)

Bt 23g1l2b - 1.95 to 1.02
except 1.66

Bt 23g1l2c - good from
1.919 to 1.15
except 1.29

Location USU Date 11/10/01

Project / Client CNWRA

KKB

√BT24g4a - data grod from 9.47 to 5.26

√Bt24g4b - data grod from 8.6 to 5.1

√Bt24g4c - 10.5 to 5.1

√Bt24g2l4a - 5.653 to 3.166

√Bt24g2l4b - 5.29 to 2.82

√Bt24g2l4c - 6.4 - 1.7

Bt24g1l2a - 1.98 to 1.34

Bt24g1l2b - 1.96 to 1 except 1.772, 1.199 1.174 (both)

Bt24g1l2c - 1.839 to 0.952

Location USU Date 11/11/01

Project / Client CNWRA

KKB

11:20

√Bt25g4a - data grod 11.2 to 6.66

√Bt25g4b - 8.65 to 4.766

√Bt25g4c - 8.57 to 4.88

√Bt25g2l4a - 5.76 to 3.196

√Bt25g2l4b - 5.8 to 2.82

√Bt25g2l4c - 6.03 to 2.62

√Bt25g1l2a - 1.94 to 1.05

√Bt25g1l2b - 1.99 to 0.99

√Bt25g1l2c - 1.85 to 1.13

√Bt26g4a - 7.47 to 1.9

√Bt26g4b - 7.058 to 1.95 except 5.917

Location USU Date 11/11/01

Project / Client CNWRA KKB

Bt 26 g4c – 6.77 to 2.32

√Bt 26 g2 l4a – 6.80 to 2.58

√Bt 26 g2 l4b – 6.12 to 1.86

√Bt 26 g2 l4c – 7.07 to 2.428

Bt 26 g1 l2a – 1.98 to 1.08
except 1.11

Bt 26 g1 l2b – 1.96 to 1.05
except 1.687
1.410
1.182 (#90)

Bt 26 g1 l2c – 1.96 to 1.02
except 1.91, 1.42, 1.07

Location USU Date 11/12/01

Project / Client CNWRA KKB

√Bt 27 g4a – 8.056 to 4.467

√Bt 27 g4b – 11.147 to 6.054
(only 5 pts)

Bt 27 g4c – 9.76 to 6.75
except 6.86

√Bt 27 g2 l4a – 5.65 to 2.28

√Bt 27 g2 l4b – 6.43 to 2.00

√Bt 27 g2 l4c – 5.28 to 2.24

Bt 27 g1 l2a – 1.88 to 1.08
except 1.75, 1.44, 1.346

Bt 27 g1 l2b – 1.93 to 1.0999
except 1.83

Bt 27 g1 l2c – 1.99 to 1.22
except 1.66

Location USU Date 11/12/01

Project / Client CNWRA

Bt 28 g4a - 9.066 to 4.83

Bt 28g4b - 8.08 to 5.26

Bt 28g4c - 14.18 - 5.246

Bt 28g2l4a - 5.96 to 2.52

Bt 28g2l4b - 5.09 to 2.24

Bt 28g2l4c - 6.11 to 2.40

Bt 28g1l2a - 1.91 to 1.022
except 1.313

Bt 28g1l2b - 1.98 to 1.017
except 1.91, 1.42(#1), 1.38
1.32, 1.14

Bt 28g1l2c - 1.98 to 1.099
except 1.388, 1.344

Location USU Date 11/13/01

Project / Client CNWRA

Bt 28g05l1b
0.383 to 0.152

Bt 28g05l1c -
0.424 to 0.307

Bt 27g05l1a - 0.489 to
0.1987

Bt 27g05l1b - 0.62 to
0.15

BT 27g05l1c - 0.54 to 0.119

BT 28g05l1a -
0.56 to 0.157

Bt 28g05l1b -

BT 27g250l05a - ? data

BT 27g250l05b - maybe good
0.218 to 0.135

BT 27g250l05c - maybe
0.245 to 0.138

Location WSU Date 11/13/01

Project / Client CNWRA KKB

Bt 27 l 250a - ?

Bt 27 l 250b - ?

Bt 27 l 250c - ?

Bt 28 g 250 l 05 - 0.244 to 0.128

Bt 28 g 250 l 05b - 0.237 to 0.145

Bt 28 g 250 l 05c - 0.220 to 0.127

Bt 28 l 250a - ?

Bt 28 l 250b - ?

Bt 28 l 250c ?

Location WSU Date 11/14/01

Project / Client CNWRA KKB

- Bt 29 g 05 l 1a - 0.531 to 0.47
- BT 29 g 05 l 1b - 0.82 to 0.212
- BT 29 g 05 l 1c - 0.606 to 0.136
- BT 29 g 250 l 05a - 0.249 to 0.116
- BT 29 g 250 l 05 b - 0.249 to 0.141
- BT 29 g 250 l 05c - 0.249 to 0.134
- BT 29 l 250a - ?
- B + 29 l 250b - ?
- Bt 29 l 250c - ?

Location USU Date 12/10/01

Project / Client CNWRA

/CLCB

*OUT OF TOWN 11/15/01 → 12/10/01

*wait on epoxy (even more) for samples

* mailed for thin sections December 10th to Spectrum Petrographics

*BT 29 - missing new pics for g1 g2 g2 g4 g4

samples given to Bill for analysis?

Location USU Date 12/11/01

Project / Client CNWRA

/CLCB

Cut BT-54-01
BT-9-01
(// to lineation
rock - line is unreadable
- refer to jim evans)

• BT-52-01

Cut 16B
1/4 m-1-01 (⊥ to strike)
1/16 C ⊥ to strike
BT-7-01

12/4/01

re pack
BT-52
BT-54-01
BT-9-01
BT-7-01

Location _____ Date _____

Project / Client 12/11/01 RWF for KKB 4/4/02

Bishop - Cuta Horsetail
BT-53-01
16c ⊥ to strike
16b -
BT-8-01
ym-1-01

reparing
16c ⊥ to strike
16b
ym-1-01 ⊥ to strike

reparing
BT-9-01
BT-10-01
16c // to strike

reparing
BT-53-01
BT-8-01

Out ym-2-01; BT-8-01

Location USU Date 1/14/02 RWF for KKB 4/4/02

Project / Client CNWRA (personal)

br SZ analysis → on Laptop
MAC - XCel

XCel files - steps toward analysis of gr sz images
BT18 - BT29

BT18.xls - PLOTS IN INDIV. Files Completed (Bin, Avg, %)
prev. see notes p 72-73
< 250 - plots
< 500 - > 250 - plots
< 1 - > 500 - plots
1 - 2

⇓

1st take files separately and sort thru data that was compared to pics at time of photo as feasible - also based on sieve size

Then we take the data from files a, b, c (BT18g/l2 a, b, c) put into 1 file as Bins of 0.1 from 1-2 = BTg/l2.xls

Location USU Date 1/14/02

Project / Client CNWRA

- files are binned & then frequencies counted for good data

EXCEL e.g. pick - TOOLS
↳ DATA ANALYSIS
↳ Histogram
↳ input range columns of mean diameter
↳ Bin Column as set for gr sz e.g. 0.1
↳ output Column

BIN	freq
↓	
more	

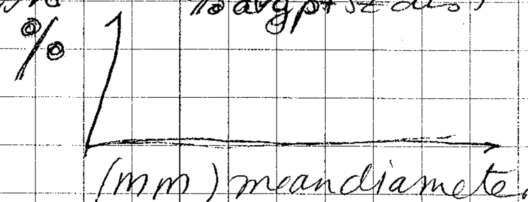
BT 18g1l2.xls
Bin Sz / aVb freq / %

Sum = H3 : H19
= 39.33

Location USU Date 1/15/02

Project / Client CNWRA rur for KKB 4/4/02

e.g. file BT18g05l1.xls
graph avg freq for ea sieve sz
graph % avg pt sz dist



BiN Sz / AVG FREQ / %

AVG(columns) avg freq

e.g. KKB 1/15
#L#90 * 100

OK KKB 1/16/02

2 methods
% x wt % of sample
↓
in file BT18 G250l500.xls
% freq
L3 * 100 / 101.67
↓
from Sum value

u-? Check files

Location USU Date ~~1~~/16/02

Project / Client CNWRA

ICICB

STILL TODO → 1/17/02

- ~~X~~ Check on AVG FREQ % Methods W/ VASILE ✓
- (X) plot graph for Bt18g1l2.xls
- (X) enter copy of freq % data to final BT18.xls file

BT 18g2l4.xls → avg freq ✓

- ✓ sort bt18g2l4a.xls (3.14)
- sort bt18g2l4b.xls (4.85 ~~5.37~~)
- sort bt18g2l4c.xls 5.33 to 3.13

[CREATE GRAPH=

BT 18 g4.xls avg freq ✓

- ✓ sort bt18g4a.xls
- ✓ sort bt18g4b.xls (except 7.773) 8.557 - 4.152
- ✓ sort bt18g4c.xls 7.26 - 3.24

[CREATE GRAPH=

Location USU Date 1/17/02

Project / Client CNWRA PMP for ICNB 4/4/02

1/17/02

* next step → start w/ BT-19-01 and address Still to do prior to p 98 this

avg freq / sum of avg freq * 100

Confusion Solved - just two ways to write w/ formula or actual sum #

BT 19 →

BT 19 l250.xls → Bin from 0.170 to 0.29 @ 0.01 Bin interval

- ✓ sort l250a.xls
- ✓ sort l250b.xls
- ✓ sort l250c.xls

avg freq + % freq calculated [create graph]=

Location USU Date 1/18/02

Project / Client CNWRA

Gr SZ Analysis KKB

BT19.xls (cont.)

✓ BT19 g250l500.xls
✓ sort - g250l500a.xls
✓ " " g250l500b " "
✓ " " g250l500c " "
✓ calculate avg freq + % freq

sort → values from 0.2 to 0.6 → maxdiam
[CREATE GRAPH] (consistency w/ BT-18 sort)
(But sort final w/ mean)

BT19g05l1.xls

✓ BT19g05l1a.xls
Bin 0.5 to 1.0
✓ BT19 g05l1b.xls
✓ BT19g05l1c.xls
values calc for avg freq / % freq

[create graph] =

Location USU Date 1/19/02 - 1/20/02

Project / Client CNWRA KKB

BT19g1l2.xls
Bin @ 1 - 2.5
✓ BT19 g1l2a.xls
✓ BT19g1l2b.xls
✓ BT19g1l2c.xls
avg freq / % freq calc.

[Create Graph] =

BT19g2l4.xls - sort from 1-4
sort a.xls ✓
b.xls
c.xls
avg freq / % freq calc.

[create graph] =
4/4/02 RWF for KKB

BT19g4.xls **1/20/02**
sort ✓ BT19g4a.xls
✓ BT19g4b.xls
✓ BT19gc.xls
✓ calculate avg freq / % freq

[create graph]

Location UNH Date 1/20/02

Project / Client CWWRA 1/21/02

KKB

Cont. gr sz analysis

BT20.xls BT20l250.xls ↓ 0.1 to 0.29 (.01 interv.)

- ✓ BT20 l252a.xls
- ✓ l250b.xls
- ✓ l250c.xls
- ✓ avg freq / % freq calculated

[Create Graph]

BT20 g250 l05.xls

- ✓ g250l05a.xls
- ✓ g250l05b.xls
- ✓ g250l05c.xls

avg freq / % freq calc

[create graph]

Location UNH Date 1/21/02

Project / Client CWWRA

KKB

BT20g05l1.xls

sort ✓ g05l1a.xls between 0.5 & 1

✓ g05l1b.xls

✓ g05l1c.xls

Calculated avg freq + % freq (wt samp.

[create Graph]

BT20g1l2.xls

sort 1 - 2.5

✓ g1l2a.xls

✓ g1l2b.xls

✓ g1l2c.xls

↑ calculate avg freq + % freq

[create Graph]

✓ ✗ Check against + - yes did this new files

Location USU Date 1/21/02
Project / Client CNWRA
1/22/02 KKB

For BT20g1l2.xls added both new & old more files so have total of 6 jpgs/more files for these data

~~BT20new~~ -
BT20g1l2a.xls
BT20g1l2b.xls
BT20g1l2c.xls

[Create Graph]

* note - check % freq. of sample %w/in bin size that avg % freq occurs - or w/in sample - we are not adding up to 100% in this file; - o.k. - what does %# actually give us vs. avg freq # / if error of not 100% know formula has error

→ % freq of sample or good data → add parentheses by *100 to % x 100 formula

BT20g2l4.xls - Bin 1-4 1/22/02 KKB
✓ BT20g2l4a.xls new - ~~[illegible]~~ 5.180 - 3.057
✓ " b. " 6.33-2.57
✓ " c " 5.49-2.96
~~[illegible]~~ - 1 "
~~[illegible]~~ -
KKB

Location USU Date 1/22/02
Project / Client CNWRA
1/23/02 KKB

all files checked to make sure %'s add to 100% on 1/24/02 KKB

BT20g4~~a~~.xls KKB
✓ g4a.xls - ~~[illegible]~~ 8.17 - 5.15 KKB
✓ g4b.xls - 6.71 - 4.76
✓ g4c.xls - 10.398 to 5.126
[CREATE GRAPH]

BT21.xls KKB
sort
✓ BT21l250a.xls Bin 0.1 to 0.29
✓ b.xls
✓ c.xls
avg freq / % freq calculated
[Create Graph]

BT21g250l05.xls
sort g250l05a.xls sort 0.2 to 0.6
" b.xls "
" c.xls "
Calc avg / % freq
[Create Graph]

Location USU Date 1/23/02

Project / Client CNWRA KCKB

* Skip rest of 21 & go to 22 for cut n paste purposes

BT22g250.xls - 0.29 to 0.1

- ✓ sort a -
- ✓ sort b -
- ✓ sort c -

avg/% freq

[Create Graph]

BT 22 g250 l05.xls 0.6 - 0.2

- sort a -
- sort b -
- sort c -

avg freq/ % calc

[Create graph]

* Back to 21:

BT21g05l1.xls - sort 1.0 - 0.5

sort

- a.
- b.
- c.

avg freq/ % calc

[create graph]

Location USU Date 1/24/02

Project / Client CNWRA KCKB

BT2|g|l2.xls sort from 1.0 - 2.5

- sort ✓ g1l2a.xls 1.9 to - .9 (@ 1.05)
- ✓ g1l2b.xls 1.9 - 1.0 1.24, 1.06 and 1.00
- ✓ g1l2c.xls 1.99 - 1.0

Calc avg freq / % freq

[Create Graph]

BT21g2l4.xls KCKB 1/24/02

- sort ✓ g2l4a.xls 6.4 - 2.8
- ✓ g2l4b.xls 6.4 - 2.3
- ✓ g2l4c.xls 4.7 to 2.56

✓ Calc avg freq + % freq

[create Graph]

BT21g4.xls

- ~ BT21g4a.xls 9.31 - 4.29
- 21g4b.xls 8.6 - 4.4
- 4c.xls 8.5 - 4.3

[Create Graph] avg freq + % freq calc

Location USU Date 1/24/02

Project / Client CNWRA

KWS

BT22.xls ←

BT22g05l1.xls – part .5-1

- ✓ g05l1a.xls
- ✓ g05l1b.xls
- ✓ g05l1c.xls

avg freq / % freq (100%)

[Create Graph]

BT22g1l2.xls – 1.0-2.5

- g1l2a.xls
- g1l2b.xls
- g1l2c.xls

avg % / avg freq = 99.9%

[create Graph]

BT22g2l4.xls

- part ✓ g2l4a.xls - 4.83-2.49
- ✓ g2l4b.xls - 5.989-2.246
- ✓ g2l4c.xls - 4.84-2.39

[Create graph] avg % / avg freq ⇒ 99.9%

Location USU Date 1/25/02

Project / Client CNWRA

KWS

* AFTER Graphs Complete - Can import JPGs into Illustrator in order to place PHOTOS NEXT TO SPECIFIC GRAPH FOR EA SIEVE SIZE w/in SZ ANALYSIS

*see pg 11 in notes

PHOTO BT22.xls & / or BT22g05l1.xls → Vertical Heterogeneity

e.g. BT22g1l2a.jpg

BT g4a.jpg

* ALSO - INCLUDE PHOTO OF SAMPLING W/DRILL FROM BT-18 - OUTCROP ↓ BT-29 PHOTO

w/ grsz DIST graphs

* Still - would like to try IMAGE PRO ON WEDGED SLICE FOR OR SZ / POROSITY ANALYSIS.

BT22g4.xls 1/26/02

- part ✓ BT22g4a.xls
- ✓ 4b.xls
- ✓ 4c.xls

avg freq / % freq ↓ 100%

[Create Graph]

Location USU Date 1/26/02

Project / Client CNWRA

LWB

BT23.xls

* sort all BT23 for max diameter first

BT23l250.xls 0.29 to 0.1

sort e250a.xls
sort f250b.xls
sort f250c.xls

[GRAPH]

Calc avg freq / % freq = 100

BT23g250l05.xls

sort ✓ BT23g250l05a.xls 0.6 - 0.2
✓ BT23g250l05b.xls
✓ g250l05c.xls

calc avg freq / % freq = 99.9%

[CREATE GRAPH]

BT23g05l1.xls .5 - 1

✓ 905l1a.xls
✓ 905l1b.xls [create graph]
✓ 905l1c.xls

avg freq / % freq = 100%

Location USU Date 1/27/02

Project / Client CNWRA

LWB

BT23g1l2.xls 1.0 - 2.5

sort ✓ g1l2a.xls
✓ g1l2b.xls
✓ g1l2c.xls

avg freq / % freq = 100%

[Create graph]

BT23g2l4.xls

g2l4a.xls
g2l4b.xls
g2l4c.xls

avg freq / % freq = 100%

[Create graph]

BT23g4.xls

g4a.xls
g4b.xls
g4c.xls

↕ avg freq / % freq = 100%

Location USU Date 1/27/02

Project / Client CNWRA

KLB

BT24.xls

BT24l250.xls .1 to .29

sort ✓ l250a.xls
l250b.xls
l250c.xls

avg FREQ/avg % = 100

[Create GRAPH]

BT24g250l05.xls .6 to .2

sort ✓ g250l05a.xls
b.xls
c.xls
avg freq / % freq = 100 %

BT24g05l1.xls .5 - 1

sort ✓ g05l1a.xls
✓ g05l1b.xls
✓ g05l1c.xls
avg freq / % freq = 100 %

[Create Graph]

Location USU Date 1/28/02

Project / Client CNWRA

KLB

BT24g1l2.xls 1.0 - 2.5

sort ✓ g1l2a.xls
✓ g1l2b.xls
✓ g1l2c.xls

avg freq / % freq = 100 %

BT24g2l4.xls

g2l4a.xls
g2l4b.xls
g2l4c.xls

avg freq / % freq = 100 %

[Create Graph]

BT24g4.xls

g4a.xls
g4b.xls
g4c.xls
avg freq / % freq = 100 %

[Create Graph]

Location USU Date 1/28/02

Project / Client CNWRA

VCR

BT25.xls

BT25l250.xls : .29 — .1

sort ✓ l250a.xls
✓ l250b.xls
✓ l250c.xls
avg freq / % freq = 100%
[Create graph]

BT25 g250l05.xls : .6 — .2

sort ✓ g250l05a.xls
✓ g250l05b.xls
✓ g250l05c.xls

avg freq / % freq = 100%
[Create Graph]

BT25 g05l1.xls

sort g05l1a.xls
g05l1b.xls
g05l1c.xls
avg freq / % freq = 100%
[Create Graph]

Location USU Date 1/28/02

Project / Client CNWRA

VCR

BT25 g1l2.xls 1.0-2.5

sort ✓ g1l2a.xls — use only data verified p 85
✓ g1l2b.xls
✓ g1l2c.xls

avg freq / % freq = 100%
[Create Graph]

BT25 g2l4.xls

sort ✓ g2l4a.xls
✓ g2l4b.xls
✓ g2l4c.xls
avg freq / % freq = 100%
[Create Graph]

BT25 g4.xls

sort ✓ g4a.xls
g4b.xls
g4c.xls
avg freq / freq %

Location LASU Date 1/29/02

Project / Client CWURA

K12B

BT26.xls 26

BT1250.xls .29-.1

sort ✓ l250a.xls
✓ l250b.xls
✓ l250c.xls

→ avg freq / % freq = 100%

{create graph}

BT26g250l05.xls 0.6-0.2

sort ✓ g250l05a.xls
✓ g250l05b.xls
✓ g250l05c.xls

avg freq / % freq = 99.9%

{create graph}

BT26g05l1.xls

sort g05l1a.xls
g05l1b.xls
g05l1c.xls

avg freq / % freq = 100%

{create graph}

Location LASU Date 1/29/02

Project / Client CWURA

K12B

BT26g1l2.xls 1-2.5

sort g1l2a.xls
g1l2b.xls
g1l2c.xls

calc. avg freq / % freq = 99.9%

{create Graph}

BT26g2l4.xls

sort ✓ g2l4a.xls
✓ g2l4b.xls
✓ g2l4c.xls

avg freq / % freq = 100%

BT26g4.xls

sort ✓ g4a.xls
✓ g4b.xls
✓ g4c.xls

avg freq / % freq = 99.9%

Location USU Date 1/29/02

Project / Client CNWRA KKB

BT27.xls

BT270250.xls

Sort ✓ 250a.xls
✓ 250b.xls
✓ 250c.xls

avg freq / % freq = 100%

BT g250105.xls 0.6 - 0.2

sort ✓ g250105a.xls
g250105b.xls
g250105c.xls

avg freq / % freq = 99.9%

BTg05l1.xls .5 - 1

done g05l1a.xls
g05l1b.xls
g05l1c.xls

Calc avg freq / % freq = 100%

Print for KKB 1/29/02 KKB

0.1 - 0.2

Location USU Date 1/29/02

Project / Client CNWRA KKB

BTg27l2.xls 1. - 2.5

Sort ✓ g1l2a.xls
✓ g1l2b.xls
✓ g1l2c.xls

avg freq / % freq = 100%

[Create Graph]

BT27g2l4.xls

g2l4a.xls 5.65 - 2.28
b.xls 6.43 - 2.
c.xls 5.28 - 2.24

avg freq / % freq = 105%

[Create Graph]

BT27g4.xls

Sort ✓ g4a.xls 8.056 - 4.467
✓ g4b.xls 11.147 to 6.057
✓ g4c.xls 9.76 to 6.75

avg freq / % freq = 105%

[Create Graph]

Location USU Date 1/30/02

Project / Client CNWRA

RWF for KKB 4/4/02

BT28.xls =

BT28l250.xls

sort ✓ l250a.xls
✓ l250b.xls
✓ l250c.xls

{create graph} avg freq / % freq = 100%

BT28g250l05.xls = 0.5-1

sort ✓ g250l05a.xls
✓ g250l05b.xls
✓ g250l05c.xls

{create graph} avg freq / % freq = 100%

BT28g05l1.xls

{create graph} sort → g05l1.xls
g05l1.xls
g05l1.xls
avg freq / % freq = 100%

Location USU Date 1/30/02

Project / Client CNWRA

RWF for KKB 4/4/02

BT28g1l2.xls = 1.0-2.5

✓ sort → g1l2a.xls
g1l2b.xls
g1l2c.xls

Create graph avg freq / % freq = 100%

BT28g2l4.xls =

sort ✓ g2l4a.xls 5.96-2.52
✓ g2l4b.xls 5.09 to 2.24
✓ g2l4c.xls 6.11 to 2.40

Create graph avg freq / % freq = 100%

BT28g4.xls

g4a.xls 9.06 to 4.93
g4b.xls 8.08 to 5.26
g4c.xls 14.18 to 5.246

avg freq / % freq = 100%

Location USU Date 1/30/02

Project / Client CNURA

RWF for KKB 7/4/02

* need to find BT29 files on zipoz uetalke ~~....~~ KKB msrements
gr * g1 l2 from jpeg
* g2 l4 files
* g4

* Fieldwork for BISHOP 2002 =>

* Plan is to meet jim evans and David Ferrill in Bishop by 3pm Sunday Feb 3rd — I will drive from Utah We will work together until Wed Feb 6th

* after that I will stay on to conduct fieldwork if needed

Location USU Date 1/30/02

Project / Client CNURA

RWF for KKB 7/4/02

BT29.xls

.1 - .29

sort BT29 l250.xls
✓ l250a.xls
✓ l250b.xls
✓ l250c.xls
avg freq / % freq = 100%
[Create Graph]

BT29 g250l05.xls 0.2 to 0.6

sort ✓ g250l05a.xls
✓ g250l05b.xls
✓ g250l05c.xls
avg freq / % freq = 100%

BT29 g05l1.xls .5 - 1
g05l1a.xls
g05l1b.xls
g05l1c.xls

avg freq / % freq = 100%

Location USU Date 1/31/02 - 2/1/02

Project / Client current

USU 1/CE13

1/31/02 -

* attempt to remove prep. for g1e2 for BT29
g2e4
g4

Most files are not accurate based on what is seen & known sieve size - so need to retrieve samples from Bill Mace - or simply not include these three files in overall averages from ventral profile

2/1/02 - Graph BT18 e250. Use to copy format on to others BT18 files to produce indiv graphs for ea sieve diam

Location USU Date 2/2/02

Project / Client current

1/CE13

2/2/02
12 - 4 pm
* Load & organize field supplies for Bishop 02 trip
* check weather - maps etc
* prep vehicle & drive

SUNDAY Feb 3, 2002
leave 6 a.m. for Bishop
From Logan, Utah
* Mileage on Truck = 86546

2/3/02 → s24 circle pt in Black

BT18 e250.xls - plot graph formats
g250e0.5 - plot graph
g05e1 - plot graph
g1e2 - plot graph
g2e4 - plot graph
g4 - plot graph
Combination plot 4 BT18.xls

Location Bishop Date 2/4/02

Project / Client CNWRA

a.m.

* Discuss final plots w/ Joe
  - cumulative-freq
  - % avg

FIELD DAY 1 - TRIP 2/2002 - BISHOP

* DAVID Ferrill, Alan Morris, Jim Evans
  Kelly Bradbury

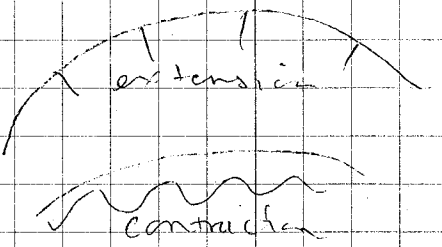
OWENS VALLEY - structure - overview

→ Normal flts w/ lots of strike slip
  ↗ owens valley is more?
  Sturcm & yucca mtn - 10 mm Rt lateral slip per year
  Rt lateral slip may step over to rt. south of owens valley rather than go thru
- FLTS BOUND E/W side of valley
- Active 1/2 graben & while tableland is rolling over into White Mtn

Location Bishop Date 2/4/02

Project / Client CNWRA

* Folding may be accomodating bending reflecting 760,000 yrs inherent deformation
  - may be seeing max displacement up @ surface



  - hypocenter should be near max anticline extension pt.

* in Q - west side is more active

Pit Review

* fr here → impede flow but channel flow between to increase flow in hi k, lo r matrix
* are fr here filled w/ caliche or ?
  Thin section analysis -
* here - sat. slug test

Location Bishop Date 2/4/02

Project / Client CNWRA

Pit Site

KLB

— 4 yuccamtn - day 2 day KLB conditions are not always wet

- in unsat zone we've seen concentration of wetness & sand fractures @ Busted Butte *excellent analogy - want to use
- document & compare as structural analogy
- Fr char by smaller gr / small fill

TODO

(A) Sample from Pit 2 — Block to get fr subarm ✓ Upwards did this

- where you are & what flitz is like - need to char. @ each

- similar setting to poorly cemented / unconsolidated sand stone w/ deformation bands → Shearing @ surface

(B) EXPAND PAVEMENT MAP @ Pit ✓
→ inventory mapping
- PHOTO MOSAICS
- Focus on Terminations styles - are they connected or Blind

Location Bishop Date 2/4/02

Project / Client CNWRA

KLB

(B) Take Digital PHOTOS - DO PHOTOMOSAIC
- & then map w/ mylar over PHOTOS - BY HAND - what we see

* Difference btwn here & yuccamtn - yuccamtn 12 m.y. - more deformation more fr systems - more complex?

* what is needed is statistical measure of connectivity & pore throat size - what is preferential flow direction

BT-56 - Pit sample of caliche fr. - 2m east of Pit 2

Crucifix Site -
* pot'l inc slip upward along fault
(A) ✓ PHOTO → fr "X" zone import into illustrator & trace over to create fa map
(K) Document Fault zone char in detail

Location: BISHOP Date: 2/4/02
Project / Client: CNWRA
VWB

Crucifix
Deformation concentrated btwn these faults

(B) → Length/Area → 2D movement

o → Fractures → connectivity
- ct. # w/in zone
- zones of fr intensity

✓ → How wide is flt zone; damage zone

• → compare HW/FW fract intensity w/in same bed

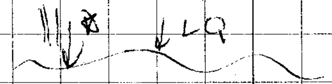
→ fr sp should dec w/ dec bed thickness

– if have hi connectivity of fr in welded sequence – get tube flow – so tube dominated flow vs fr. flow
important for hydroids to know

Location: BISHOP Date: 2/04/02
Project / Client: CNWRA
VWB

LOVERS QUARRY
* CLOSED 4 raptors til July 31st 2002

→ Looks like flt in slope down rd w/ damage zone



4 HORTON CREEK Site

* No veining in welded layers

* slip is easily distributed thru w/out the cap

p.m.
meet w/ Jim/David/Alan

* faults capture several lithologies
→ get sense of small flt near monocline near pit Quarry
→ damage zone @ Crucifix
→ pavement maps

Location Bishop Date 2/4/02

Project / Client CNWRA

KLCB

Understand fit in nonwelded tuffs as analog for yucca mtn
→ tie into stratigraphy

grsizplots →
BT18g250l05 plot → into Adobe Illus
bring jpeg BT18g250l05b
save as BT18g250l05 %plot

calculate for BT18.xls - wt% of ea sievesize
KLCB

% 341-108/341 ×100 = % ~~less~~ < 4mm

341-408-55.2/341 ×100 = % < 2mm
= 68%

" "

↓
< 250μm

*create D50 plots w/ grain distribution

Location Bishop Date 2/4/02 - 2/5/02

Project / Client CNWRA

KLCB

FOR TOMORROW -
* BROOM - Quarry Map
* CARDBOARD
↳ EXTEND PAVEMENT MAP
(1 DAY) - TUES.
↳ Finish Crucifix (Tues → A.M.) → NOON PHOTOS
cross-out OKing Ruff 4/4/02 ✓ use for mapping

2/5/02 Sunny, Nice :)

* Backhoe Pit -
construct 2m x 3m
Fracture Trace GRID
w/ string - sweep after up to clear pavement

* pavement map B -
connects w/ pavement map A
(see map A, B)

cross-out OKing Ruff 4/4/02 KLCB refer to fracture near 0.35 [redacted] cm base or South end of pavement A

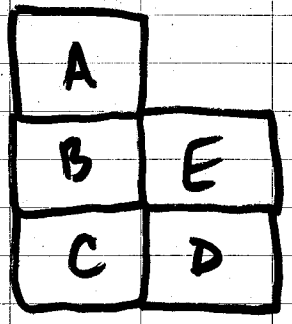
* pavement map C (see map)
constructed w/ 3m x 2m grid

Location BISHOP CNWRA Date 2/5/02

Project / Client KCRS

4 pavement maps D constructed w/ 3 m x 2 m Grid

* pavement map E constructed w/ 3m x 2m grid



↙ pavement are w/in horsetail structure @ tip of Fault w/ in borrow pit

See David Ferrills & Notes by Alan Morris

{ brief left @ E - plan to Return on 2/7/02 to continue }

Location BISHOP Date 2/5/02

Project / Client CNWRA

KCRS

- Return to Crucifix Site w/ JPE vans to collect drying epoxy samples
- Meet David & Alan there

Meet w/ JPE vans (ave)

- Plan for week is to map detailed fracture map off Crucifix Fault using digital aerial images as base/ref.
- continue w/ pavements
- work on digital file to transfer to my laptop

Location BISHOP Date 2/6/02

Project / Client CNWRA

KFB

a.m. - melt w/ jpe, david, alan

printout photos from Crucifix site

- crucifix west
- crucifix east
- crucifix central
- crucifix central scale

CRUCIFIX SITE →

* sample @ least 2hr prior to end of day to let foam sealant expand

+ hydro

LOOK @ Kissues based on lithology
- look @ LITHOLOGY & structposition
- domin perm tests in diff. lithologies @ this site
  - mapon photographs

Location BISHOP Date 2/6/02

Project / Client CNWRA

KFB

↳ jp evans - good place to do perm. tests thru deform / undeform rock

along chalk bluffs road & above outcrop - may be able to get welded seq

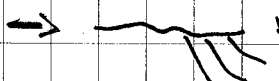
TODO: CRUCIFIX FOCUS * pick sites for info. tests

* → get semi quant. more of deform w/in Fit zone & outside

→ monolines dewel following cooling jts

→ cooling jts to die out in run welded sequence

→ wedges may be defined by preex jts -

→  Hor strain → Fr zones @ Bmw pit

Hi° of anisotropy -

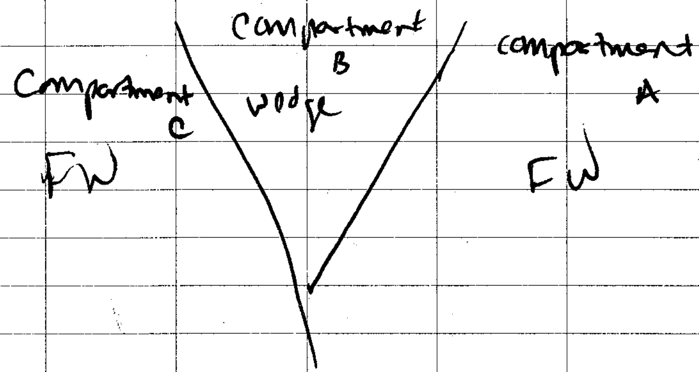
Location BISHOP Date 2/6/02

Project / Client CNWRA

ALAN MORRIS
→ purpose of pavement: get directions & variations of fractures - these will control flow in various dir. rather than just main flt orientation controlling flow so important to understand these fr. characteristics

Crucifix - synthetic flt z.

Crucifix FAULT -
MAPPING on PHOTOS - begin w/ Crucifix east photo by jpearns



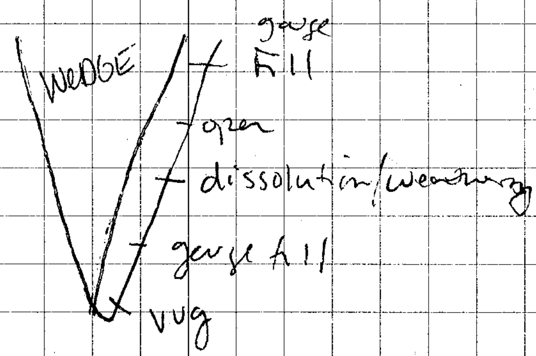
Location BISHOP Date 2/6/02

Project / Client CNWRA

- Create outline of figures that i'll DO
- Samples curing ✓
- PHOTO LOVERS Quarry ✓
- Quick map, msmnt, samples of EKB fault east of Crucifix fault

crossed out okay RWF 4/4/02

Crucifix PHOTO EAST →



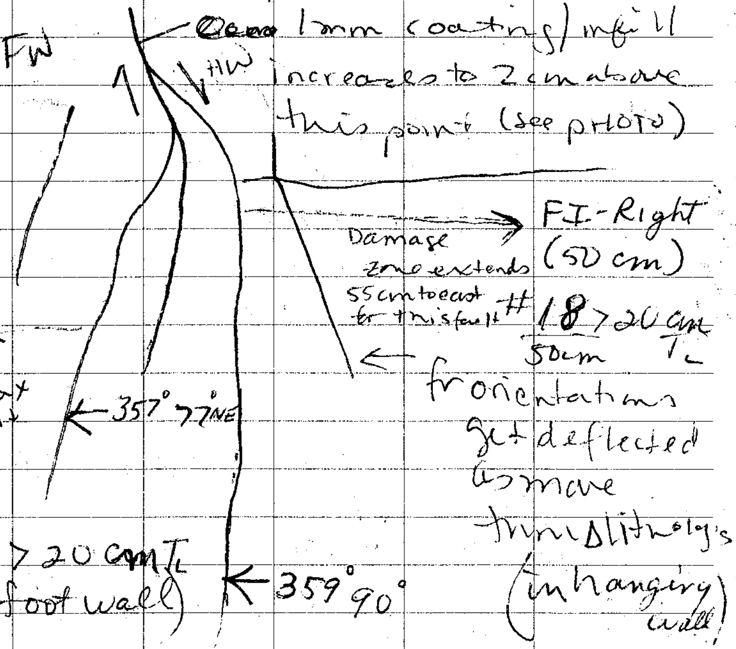
East of Fault Wedge 5.5m
Small fault w/ 10 cm offset may mark edge of damage zone
↓

Location KKB 2/06/02 BISHOP Date 2/06/02

Project / Client CNWRA

Crucifix (cont'd)
small fault - east of wedge
see PHOTOS

Strike & Dip = See Sketch & PHOTOS



Location BISHOP Date 2/07/02 KKB

Project / Client CNWRA

Back @ the Crucifix
- seal BT-70-02

- continue mapping on upper outcrop using PHOTOS

Remember to -
* compare HW/FW fr Intensity w/in same beds
* fr. connectivity
* more offset @ eastern fault

o/c open test

cross-out okay RWF 4/4/02

- frac cleavage beds above fault can really see two sets ~~ver~~ both hi ∡ to vert which produce blocks w/ the hi ∡ - vert fr seen in photos are orient → 015/75SW >T_L & are rel. planar

w/in 140cm thick bed KCC

see PHOTOS

→ the smaller T_L fr may be related to surficial processes slight unloading? very corrugated

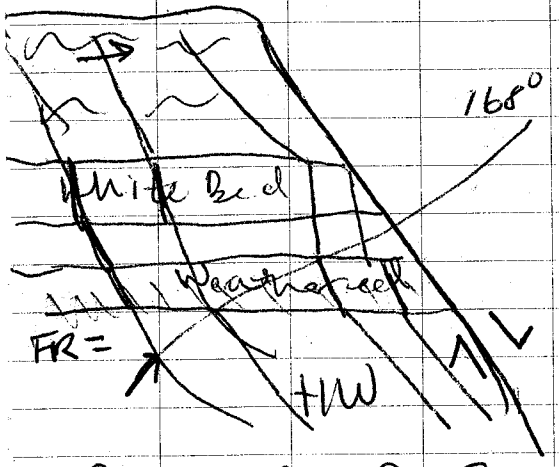
Location BISHOP CNWRA Date 2/7/02

Project / Client KLB

These are

See PHOTO - Ref. Sketches ONLY / compare to Digital photos

Fault East of Crucifix fault



Damg Zone = 7.5 m in HW

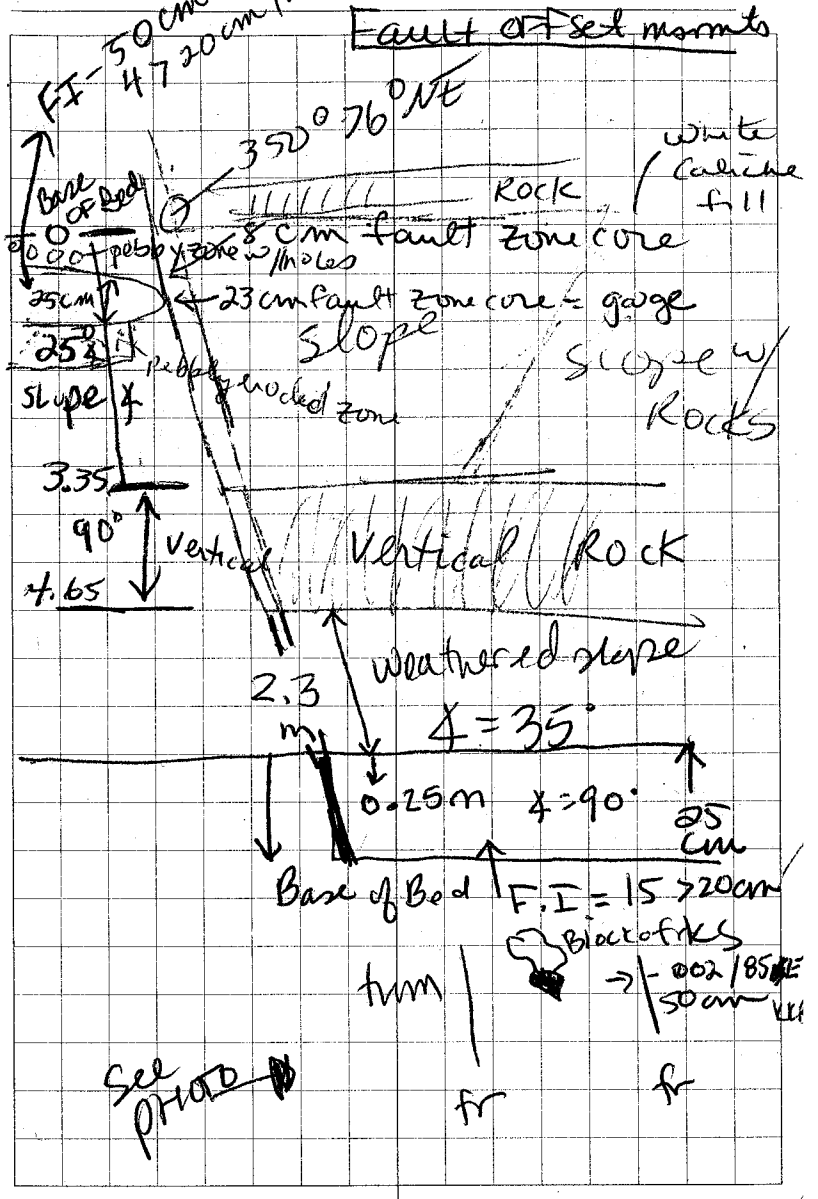
Fr are deflected thru diff Beds

Vertical in White ashbed

Location BISHOP CNWRA Date 2/07/02

Project / Client

Fault offset measmts



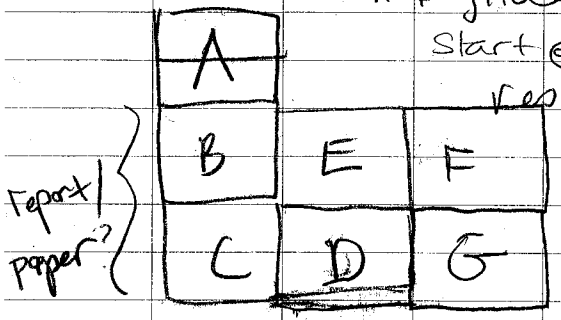
Location Borrow Pit - Bishop Date 2/7/02

Project / Client CNWRA

LCB

Borrow Pit pavement map

* Digital photos
  start @ E grid
  rep + w/o grid



* Large patches of caliche deposition pavements F & G include several interconnecting fractures

Location BISHOP/LEDAW Date 2/7/02

Project / Client

LCB

TRIP to Lajan -

* prepared outline of Figures; notes from Bishop fieldwork & data analysis
  - get to J. R this week

TOTAL mileage for Feb 2002 trip
= 1165 miles

* emailed outline of paper to dave, jim, david, alan, randy, craig 2/14/02

Location USU Date 2/02

Project / Client CNURA (2002) RWF for (KKB 4/4/02

KKB

XRD invoice / Hours → USU equip

TOTAL Hours to date 2/8/02
= 44 HRS

cross-out okay RWF 4/4/02

Rate = $ KKB / HR
10

35 Samples total
0.10 g vial

Cross-outs noted as okay by Randy Feder (RWF) were added 4/4/02. The cross-out being noted as okay because they do not affect the meaning or intent of what KKB wrote, or that the cross-out does not affect the scientific integrity of the work

RWF 4/4/02

I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

C. C. Pow 4/18/2002

Common Field Data Error Codes

Error Codes Are Used to Explain Common Mistakes and Are Written Above or Close to the Mistake
Commonly Used Error Codes Include:

- RE Recording Error
- CE Calculation Error
- TE Transcription Error
- SE Spelling Error
- CL Changed for Clarity
- DC Original Sample Description Changed After Further Evalutaion
- WO Write Over
- NI Not Initialled and Dated at Time of Entry
- OB Not Recorded at the Time of Initial Observation

Note: Error Code Should Be Circled, Dated And Initialed When Recorded.

Hazard Classifications

Class 1 Explosives
Class 2 Gas
Class 3 Flammable Liquid
Class 4 Flammable Solids (Potential spontaneous combustion, or emission of flammable gases when in contact with water)
Class 5 Oxidizing Substances and Organic Peroxides
Class 6 Toxic (poisonous) and infectious substances
Class 7 Radioactive material
Class 8 Corrosives
Class 9 Miscellaneous dangerous goods

Container type abbreviations (for sampling guidelines):

BR - Boston Round
ABR - Amber Boston Round
AJ - Amber Jug
CWM - Clear Wide Mouth
AWM - Amber Wide Mouth
Poly - Polyethylene Bottles
BOD Bottle

All of these guidelines are subject to change. Always refer to the EPA or SW methods for confirmation. This is meant only as a general guide for environmental sampling. Rev. 12/95

Sample Collection & Analysis Guidelines for Surface Water, Effluent and Drinking Water

Parameters	Volume	EPA Method Water/Wastewater	Container	Preservative	Holding Times
acidity	100 ml	305	Poly	Cool @ 4 c	14 days
Alkalinity	100 ml	310	Poly	Cool @ 4 c	14 days
Ammonia	400 ml	350	Poly	pH<2 H_2SO_4, 4 c	28 days
Asbestos (Drinking Water)	2 l	600/4-83-043	ABR	4 c	48 hours
Biochemical Oxygen Demand	1 l	405.1	Poly	Cool @ 4 c	48 hours
Bromide	100 ml	320.1	Poly	none required	28 days
Chemical Oxygen Demand	50 ml	410	Poly	pH<2 H_2SO_4, 4 c	28 days
Chloride	50 ml	300.0, 325	Poly	none required	28 days
Chlorine total residual	200 ml	330	Poly	none required	anal immed
Color	50 ml	110	Poly	Cool @ 4 c	48 hours
Cyanide total & amenable	500 ml	335.2, 335.1	Poly	(2) pH>12 NaOH & 6 gm Asbc Acid 4 c	14 days
Fluoride	300 ml	300.0, 340	Poly	none required	28 days
Hardness	100 ml	130	Poly	pH<2 HNO_3/H_2SO_4	6 months
Hydrogen ion (pH)	25 ml	150	Poly	none required	anal immed
Kjeldahl & Organic Nitrogen	500 ml	351	Poly	pH<2 H_2SO_4, 4 c	28 days
Chromium VI	200 ml	218.4, 218.5	Poly	Cool @ 4 c	24 hours
Mercury	100 ml	245	Poly	pH,2 HNO_3	38(g)/13(HDPE)
Metals	200 ml	200 series/200.7	Poly	pH<2 HNO_3	6 months
Nitrate	100 ml	300.0, 352.1	Poly	Cool @ 4 c	48 hours
Nitrate-Nitrite	100 ml	300.0, 353	Poly	pH<2 H_2SO_4, 4 c	28 days
Nitrite	50 ml	300.0, 354.1	Poly	Cool @ 4 c	48 hours
Oil & Grease	1 l	413	ABR	pH<2 H_2SO_4/HCL, 4 c	28 days
Organic Carbon(TOC)	25 ml	415	Poly	pH<2 HCL/H_2SO_4, 4 c	28 days
Oxygen, dissolved (probe)	300 ml	360.1	BOD Btl.	none required	anal immed
Oxygen, dissolved (winkler)	300 ml	360.2	BOD Btl.	(3) fix on site/dark	8 hours
Petrol. Hydrocarbons(TRPH)	1 l	418.1	AWM	pH<2 H_2SO_4/HCL, 4 c	28 days
Phenolics	500 ml	420	BR	pH<2 H_2SO_4, 4 c	28 days
Phosphorus, Hydrolyzable	50 ml	365.2	Poly	pH<2 H_2SO_4, 4 c	48 hours
Phosphorus, Orthophosphate	50 ml	300.0, 365.2	Poly	filter immed. 4 c	48 hours
Phosphorus, total	50 ml	365.2	Poly	pH<2 H_2SO_4, 4 c	28 days
Phosphorus, total dissolved	50 ml	365.2	Poly	Filter, pH<2 H_2SO_4, 4 c	24 hours
Residue, total	100 ml	160.3	Poly	Cool @ 4 c	7 days
Residue, filterable (TDS)	100 ml	160.1	Poly	Cool @ 4 c	7 days
Residue, Non filterable (TSS)	100 ml	160.2	Poly	Cool @ 4 c	7 days
Residue, settleable	1 l	160.5	AJ	Cool @ 4 c	48 hours
Residue, Volatile	100 ml	160.4	Poly	Cool @ 4 c	7 days
Silica	50 ml	370.1	Poly	Cool @ 4 c	28 days
Specific Conductance	100 ml	120.1	Poly	Cool @ 4 c	28 days
Sulfate	50 ml	300.0	Poly	Cool @ 4 c	28 days
Sulfide	500 ml	376	Poly	pH>9 NaOH, ZnOAc, 4 c	7 days
Sulfite	50 ml	377.1	Poly	none required	anal immed
Surfactants (MBAS)	250 ml	425.1	Poly	Cool @ 4 c	48 hours
Temperature	1 l	170.1	Poly	none required	anal immed
Turbidity	100 ml	180.1	Poly	Cool @ 4 c	48 hours
Purgeable Halocarbons	5 ml	601, 624	GV	(1) .008% $Na_2S_2O_3$, 4 c	14 days
Purgeable aromatic Hyd. carb.	5 ml	602, 624	GV	(1) pH<2 HCL, $Na_2S_2O_3$, 4 c	14 days
Acrolein & Acrylonitrile	5 ml	603	GV	(1) pH 4-5, $Na_2S_2O_3$, 4 c	14 days
Phenols	1 l	604	AJ	(1) .008% $Na_2S_2O_3$, 4 c	7 days
Benzidines	1 l	605	AJ	(1) .008% $Na_2S_2O_3$, 4 c pH=4. Dark	7 days
Phthalate Esters	1 l	606	AJ	Cool @ 4 c	7 days
Nitrosamines	1 l	607	AJ	(1) $Na_2S_2O_3$, 4 c, Dark, pH7-10	7 days
PCB's	1 l	608	AJ	Cool @ 4 c	7 days
Pesticides, Chlorinated	1 l	608	AJ	(1) pH 5-9, Cool 4 c, $Na_2S_2O_3$	7 days
Nitroaromatics & Isophorone	1 l	609	AJ	4 c	7 days

Parameters	Volume	Water/Wastewater	Container	Preservative	Times
Polynuclear Aromatic Hydcarbn	1 l	610	AJ	(1) $Na_2S_2O_3$, 4 c Dark	7 days
Haloethers	1 l	611	AJ	(1) .008% $Na_2S_2O_3$, 4 c	7 days
Chlorinated Hydrocarbons	1 l	612	AJ	Cool 4 c	7 days
Chlorinated Herbicides	1 l	6640(SM 17th Ed.)	AJ	(1) Cool 4 c, .008% $Na_2S_2O_3$	7 days
Dioxins & Furans	1 l	613, 1613	AJ	(1) .008% $Na_2S_2O_3$, 4 c	7 days
Pesticides, Organophosphorus	1 l		AJ	(1) pH 5-9, Cool 4 c, .008% $Na_2S_2O_3$	7 days
Radiological test, gross A & B	1 l		Poly	pH<2 HNO_3	6 months
Radium (Total)	1 l		Poly	pH<2 HNO_3	6 months
Coliform, Fecal & Total	100ml	9221, 9222-SM 17th	Poly	(1) .008% $Na_2S_2O_3$, 4 c	6 hours
Fecal Streptococci	100ml	9230 (SM 17th Ed.)	Poly	(1) .008% $Na_2S_2O_3$, 4 c	6 hours
Nonhalogenated volatile orgnic	5 g		GV	(1)4 Drops HCL, cool 4 c, .008% $Na_2S_2O_3$	14 days
Volatile Organics	5 ml	624,1624	GV	(1)4 Drops HCL, cool 4 c, .008% $Na_2S_2O_3$	14 days
Semi Volatile Organics	1 l	625, 1625	AJ	(1) Cool 4 c, .008% $Na_2S_2O_3$	7 days
TCLP Extrctn (Haz Waste Tox)	4 l		AJ	None	7 days
Haz Waste Corrosivity	2 l		AJ	None	7 days
Haz Waste Ignitability	100ml		BR	None	7 days
Haz Waste Rctvty-Cyn/Sulf	250ml		Poly	Cool @ 4 c Dark	7 days

Sampling Guidelines (Solids)

Parameters	Volume	Method Solid Waste	Container	Holding Times
Hydrogen ION (pH)	20 g	9042,9045	CWM	analyze immed.
Chromium VI	2 g	7196,7197	CWM	24 Hours
Mercury	2 g	7470,7471	CWM	8(g)13(HDPE)
Metals (expt Chromium VI&HG)	2 g	7000 Series/6010	CWM	6 months
Nitrate		9200	CWM	48 hours
Oil & Grease	20 g	9070,9071	CWM	28 days
Organic Carbon (TOC)	10 g	9060	CWM	28 days
Phenolics		9065		28 days
Sulfate		9038		28 days
Sulfide		9030		7 days
Purgeable Halocarbons	5 g	8010,8240	CWM	14 days
Purgeable Aromatic Hydrcrbns	5 g	8020	CWM	14 days
Acrolein & Acrylonitrile	5 g	8030	CWM	14 days
Phenols	30 g	8040, 8270	CWM	7 days(40 days AE)
Benzidines	30 g	8270	CWM	7 days(40 days AE)
Phthalate Esters	30 g	8060,8270	CWM	7 days(40 days AE)
Nitrosamines	30 g	8270	CWM	7 days(40 days AE)
PCB's	30 g	8080	CWM	7 days(40 days AE)
Pesticides	30 g	8080	CWM	7 days(40 days AE)
Nitroaromatics & Isophorone	30 g	8090, 8270	CWM	7 days(40 days AE)
Polynuclear Aromatic Hydrcrbn	30 g	8100, 8270, 8310	CWM	7 days(40 days AE)
Haloethers	30 g	8270	CWM	7 days(40 days AE)
Chlorinated Hydrocarbons	30 g	8120, 8270	CWM	7 days(40 days AE)
Chlorinated Herbicides	50 g	8150	CWM	7 days(40 days AE)
Dioxins & Furans	10 g	8280, 8290	CWM	7 days (40 days AE)
Total Organic Halogens(TOX)		9020		7 days
Pesticides, Organophosphorus	30 g	8140	CWM	7 days(40 days AE)
Radiological Test, Gross A&B		9310		6 months
Radium (Total)		9315,9320		6 months
Coliform, Fecal & Total		9131, 9132		6 hours
Nonhalogenated Volatile Organic	5 g	8015, 8240	CWM	14 days
Volatile Organics	5 g	8240	CWM	14 days
Semi Volatile Organics	30 g	8270	CWM	7 days(40 days AE)
TCLP Extrctn (Haz Waste Tox)	300g	1311	CWM	7 days
Haz Waste Corrosivity		1110		7 days
Haz Waste Ignitability		1010,.1020		7 days
Haz Waste Reactivity-Cyn/Sulf	10 g	7.3.3.2, 7.3.4.2	CWM	7 days

Approximate Volume of Water in Casing or Hole

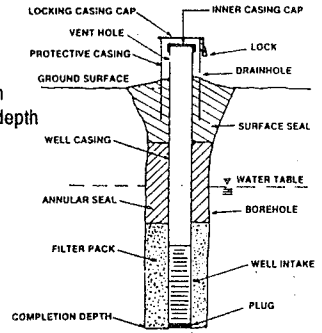
Diameter of Casing or Hole (in.)	Gallons Per Foot of Depth	Cubic Feet Per Foot of Depth	Liters Per Meter of Depth	Cubic Meters Per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
1½	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.204	2.024×10^{-3}
2½	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
3½	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
4½	0.826	0.1104	10.28	10.26×10^{-3}
5	1.020	0.1364	12.67	12.67×10^{-3}
5½	1.234	0.1650	15.33	15.33×10^{-3}
6	1.469	0.1963	18.24	18.24×10^{-3}
7	2.000	0.2673	24.84	24.84×10^{-3}
8	2.611	0.3491	32.43	32.43×10^{-3}
9	3.305	0.4418	41.04	41.04×10^{-3}
10	4.080	0.5454	50.67	50.67×10^{-3}
11	4.937	0.6600	61.31	61.31×10^{-3}
12	5.875	0.7854	72.96	72.96×10^{-3}
14	8.000	1.069	99.33	99.35×10^{-3}
16	10.44	1.396	129.65	129.65×10^{-3}
18	13.22	1.767	164.18	164.18×10^{-3}
20	16.32	2.182	202.68	202.68×10^{-3}
22	19.75	2.640	245.28	245.28×10^{-3}
24	23.50	3.142	291.85	291.85×10^{-3}
26	27.58	3.687	342.52	342.52×10^{-3}
28	32.00	4.276	397.41	397.41×10^{-3}
30	36.72	4.909	456.02	456.02×10^{-3}
32	41.78	5.585	518.87	518.87×10^{-3}
34	47.16	6.305	585.68	585.68×10^{-3}
36	52.88	7.069	656.72	656.72×10^{-3}

1 Gallon water weights 8.33 lbs. = 3.785 Kg
1 Liter water weights 1 Kg = 2.205 lbs
1 Gallon per foot of depth = 12.419 liters per meter of depth
1 Gallon per foot of depth = 12.419×10^{-3} cu M per M of depth

$V = \pi R^2 H$ (Volume of a Cylinder)

standing water = (depth to water) - (depth of well)
water column = (water level) - (water depth)
water column vol (Gal) = (water column)
x (casing diameter factor)

Permanent Monitoring Well



Source: Nielsen Environmenta
Field School, Galena, OH

Schedule 40 PVC Pipe

Nominal size	Max PSI at 74° F	OD	ID	Nominal Wall	Nominal Weight per 100
1/2"	600	0.840"		0.109"	16.2Lbs
3/4"	480	1.050"	0.824"	0.113"	21.5Lbs
1'	450	1.315"	1.049"	0.133"	32.0Lbs
1 1/4"	370	1.660"	1.380"	0.140"	43.4Lbs
1 1/2"	330	1.900"	1.610"	0.145"	51.9Lbs
2"	280	2.375"	2.067"	0.154"	69.8Lbs
2 1/2"	300	2.875"	2.469"	0.203"	111.0Lbs
3"	260	3.500"	3.068"	0.216"	145.0Lbs
4"	220	4.500"	4.026"	0.237"	206.0Lbs
5"	n/a	5.563"	5.047"	0.258"	277.0Lbs
6"	180	6.625"	6.065"	0.280"	363.0Lbs
8"	160	8.625"	7.961"	0.332"	563.0Lbs
10"	140	10.750"	10.020"	0.365"	775.0Lbs
12"	130	12.750"	11.938"	0.406"	1030.0Lbs

Schedule 80 PVC Pipe

Nominal Size	Max PSI at 74°	OD	ID	Nominal Wall	Nominal Weight per 100
1/2"	850	0.840"	0.546"	0.147"	20.6Lbs
3/4"	690	1.050"	0.742"	0.154"	28.0Lbs
1"	630	1.315"	0.957"	0.179"	41.3Lbs
1 1/4"	520	1.660"	1.278"	0.191"	57.1Lbs
1 1/2"	470	1.900"	1.500"	0.200"	69.2Lbs
2"	400	2.375"	1.939"	0.218"	95.8Lbs
2 1/2"	420	2.875"	2.323"	0.276"	146.0Lbs
3"	370	3.500"	2.900"	0.300"	196.0Lbs
4"	320	4.500"	3.826"	0.337"	286.0Lbs
5"	n/a	5.563"	4.768"	0.375"	392.0Lbs
6"	280	6.625"	5.761"	0.432"	546.0Lbs
8"	245	8.625"	7.625"	0.500"	830.0Lbs
10"	230	10.750"	9.564"	0.593"	1230.0Lbs
12"	230	12.750"	11.376"	0.687"	1690.0Lbs

Soil Classification

	mm	inches	Sieve Sizes
Boulders	>300	>11.8	-
Cobbles	75-300	2.9-11.8	-
Coarse Gravel	75-19	2.9-.75	-
Fine Gravel	19-4.8	.75-.19	3/4" - No. 4
Coarse Sand	4.8-2.0	.19-.08	No. 4 - No. 10
Medium Sand	2.0-.43	.08-.02	No. 10 - No. 40
Fine Sand	.43-.08	.02-.003	No. 40 - No. 200
Fine silt & clay	< .08	< .003	< No. 200

Clay

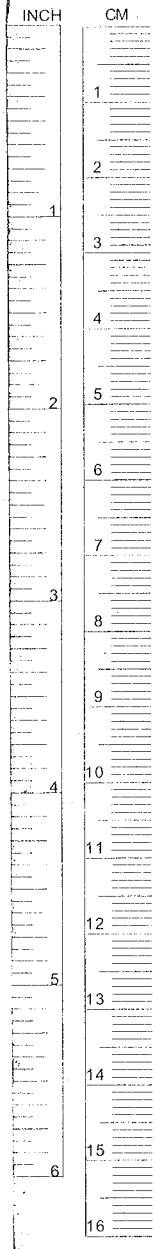
Clay Consistency	Thumb Penetration	SPT, N Blows/Ft.	Undrained shear strength c (PSF) Torvane	Unconfined Compressive Strength q Pocket Penetrometer
Very Soft	Penetrated several inches by thumb. Escapes between thumb and fingers when squeezed in hand.	<2	250	500
Soft	Penetrated one inch by thumb. Molded by light finger pressure.	2-4	250-500	500-1000
Medium Soft	Penetrated over 1/4" by thumb with moderate effort. Molded by strong finger pressure.	4-8	500-1000	1000-2000
Stiff	Indented 1/4" with thumb, but only penetrated with great effort.	8-15	1000-2000	2000-4000
Very Stiff	Readily indented by thumbnail.	15-30	2000-4000	4000-8000
Hard	Indented only with difficulty, by thumbnail.	>30	>4000	>8000

Sand

Soil Type	SPT N Blows/Ft.	Relative Density%	Field Test
Very Loose Sand	4	0-15	Easily Penetrated with 1/2" rod pushed by hand.
Loose Sand	4-10	15-35	Easily penetrated with 1/2" rod pushed by hand.
Med. Dense Sand	10-30	35-65	Penetrated a foot with 1/2" rod driven with a 5lb hammer.
Dense Sand	30-50	65-85	Penetrated a foot with 1/2" rod driven with a 5lb hammer.
Very Dense Sand	50	85-100	Penetrated inches with a 1/2" rod driven with a 5lb hammer.

Soil Classification

Coarse-grained Soils More than half of material is larger than No. 200 sieve	Gravel More than half of coarse fraction is larger than No. 4 sieve	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-graded gravels, gravel sand mixtures, little or no fines
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands, gravelly sands, little or no fines.
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures
Fine-grained Soils More than half of material is smaller than No. 200 sieve	Silts and Clays Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, , gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
	Highly Organic		Pt	Peat and other highly organic soils



MEASUREMENT CONVERSIONS

IF YOU KNOW	MULTIPLY BY	TO FIND
LENGTH		
inches	2.540	centimeters
feet	30.480	centimeters
yards	0.914	meters
miles	1.609	kilometers
millimeters	0.039	inches
centimeters	0.393	inches
meters	3.280	feet
meters	1.093	yards
kilometers	0.621	miles
WEIGHT		
ounces	28.350	grams
pounds	0.453	kilograms
grams	0.035	ounces
kilograms	2.204	pounds
VOLUME		
fluid ounces	29.573	milliliters
pints	0.473	liters
quarts	0.946	liters
gallons (U.S.)	3.785	liters
milliliters	0.033	fluid ounces
cubic inches	0.01639	liters
cubic inches	0.0043	gallons
TEMPERATURE		
$^{\circ}C = (^{\circ}F - 32) \times .555$		$^{\circ}F = 1.80(^{\circ}K - 273.15) + 32$
$^{\circ}F = (^{\circ}C \times 1.8) + 32$		$^{\circ}K = ^{\circ}C + 273.15$
$^{\circ}C = ^{\circ}K - 273.15$		$^{\circ}K = 0.555\ (^{\circ}F + 273.15) - 32$

Inches	Decimals of foot	Millimeters
1/16	.0052	1.5875
1/8	.0104	3.1750
3/16	.0156	4.7625
1/4	.0208	6.3500
5/16	.0260	7.9350
3/8	.0313	9.5250
1/2	.0417	12.700
5/8	.0521	15.875
3/4	.0625	19.050
7/8	.0729	22.225
1"	.0833	25.400
2"	.1667	50.800
3"	.2500	76.200
4"	.3333	101.60
5"	.4167	127.00
6"	.5000	152.40
7"	.5833	177.80
8"	.6667	203.20
9"	.7500	228.60
10"	.8333	254.00
11"	.9167	279.40
1 foot	1.0000	304.80

Additional Conversions

Concentrations

mg/L = 1000.30 ppb
mg/L = 1.00030 ppm
ppb = 0.00100 mg/L
ppm = .99970 mg/L
mg/L = (0.00245 x cu.ft./sec.) tonnes/day
mg/L = (0.0000864 x L/sec.) tonnes/day
mg/L = (0.00270 x cu.ft./sec.) tons/day
tons/day = (370.79782÷cu.ft./sec.) mg/L
tonnes per day = (408.73452÷cu.ft./sec) mg/L
tonnes per day = (11574.07407÷L/sec.) mg/L

Volume/ Flow or Time

Cubic ft./sec. = 1.98347 Acre ft./day
Cubic ft./sec. = 0.64632 Million gallons/day
Cubic ft./sec. = 448.83117 Gallons/min.
Cubic ft./sec. = 0.02832 Cubic meters/sec.
Cubic ft./sec. = 28.31685 Liters/sec.
Cubic ft./sec. = 373.73 Imperial gallons/min.

Gallons/min. = 0.00223 Cubic ft./sec.
Gallons/min. = 6.309×10^{-5} Cubic meters/sec.
Gallons/min. = 0.06309 Liters/sec.

Cubic meters/sec. = 1000.00012 Liters/sec
Cubic meters/sec. = 35.31467 Cubic ft./sec.

Liters/sec. = 0.001 Cubic meters/sec.
Liters/sec. = 0.03531 Cubic ft./sec.
Liters/sec. = 15.85032 Gallons/min.

Million gallons/day = 1.54723 Cubic ft./sec.
Million gallons/day = 3.06888 Acre ft./day

Acre ft./day = 0.504167 Cubic ft./sec.
Acre ft./day = 0.325851 Million gallons/day

Velocity

ft./sec. = 0.304800 m/s
ft./sec. = 0.681818 mph
km/hr. = 0.277778 m/s
km/hr. = 0.621371 mph

Acceleration

ft./s/s = 0.304600 m/s/s
m/s/s = 3.280640 ft./s/s

Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA HW NUMBER	CONTAMINANT	REGULATORY LEVEL (mg/L)	ANALYTE CATEGORY
D004	Arsenic	5.0	Metal
D005	Barium	100.0	Metal
D018	Benzene	0.5	Volatile
D006	Cadmium	1.0	Metal
D019	Carbon tetrachloride	0.5	Volatile
D020	Chlordane	0.03	Pesticide
D021	Chlorobenzene	100.0	Volatile
D022	Chloroform	6.0	Volatile
D007	Chromlum	5.0	Metal
D023	o-Cresol	200.0	Acid Extractable
D024	m-Cresol	200.0	Acid Extractable
D025	p-Cresol	200.0	Acid Extractable
D026	Cresol	200.0	Acid Extractable
D016	2.4-D	10.0	Pesticide
D027	1.4-Dichlorobenzene	7.5	Base Neutral
D028	1.2-Dichloroerhane	0.5	Volatile
D029	1.1-Dichloroethylene	0.7	Volatile
D030	2.4-Dinitrotoluene	0.13	Base Neutral
D012	Endrin	0.02	Pesticide
D031	Heptrachlor (and its hydroxide)	0.008	Pesticide
D032	Hexachlorobenzene	0.13	Base Neutral
D033	Hexachlorobutadiene	0.5	Base Neutral
D034	Hexachloroethane	3.0	Base Neutral
D008	Lead	5.0	Metal
D013	Lidane	0.4	Pesticide
D009	Mercury	0.2	Metal
D014	Methoxychlor	10.0	Pesticide
D035	Methyl ethyl ketone	200.0	Volatile
D036	Nitrobenzene	2.0	Base Neutral
D037	Pentachlorophenol	100.0	Acid Extractable
D038	Pyridine	5.0	Base Neutral
D010	Selenium	1.0	Metal
D011	Silver	5.0	Metal
D039	Tetrachoroethylene	0.7	Volatile
D015	Toxaphene	.05	Pesticide
D040	Trichlorcethylene	.05	Volatile
D041	2.4.5-Trichlorophenol	400.0	Acid Extractable
D042	2.4.6-Trichlorophenol	2.0	Acid Extractable
D017	2.4.5-TP (Silvex)	1.0	Pesticide
D043	Vinyl chloride	.02	Volatile

Hazardous Waste Number

Phone List:

Emergency Numbers:

National Response Center - 1 - 800 - 424 - 8802

Fire - _____

Ambulance - _____

Poison Control - _____

Additional Numbers:

1