

308

Q200409240004

Scientific Notebook No. 515: Structural
Characterization of the Bishop Tuff and
Hydrologic Implications of the Fracture
Systems and Lithology in the Unsaturated
Zone (02/11/2002 through 04/03/2002)

LABORATORY NOTEBOOK

CNWRA/SwRI

CNWRA
CONTROLLED
COPY 515

NOTEBOOK NO. _____

ISSUED TO Randall Fedors

ON for xeroxes of Kelly Keighley Bradbury's field notebook

DEPARTMENT Utah State University

RETURNED _____

Kelly Bradbury → KKB initials
205 W1005
Smithfield UT
435-563-8216 / 797-1267

RWF 4/15/02

This notebook contains the continuation of work dealing with structural characterization of the Bishop Tuff & hydrologic implications of fracture systems and lithology in the unsaturated zone. Continuation of sci. notebook #486

Collaborators: James P. Evans (USU) ^{dept. of Geology}
Randy Fedors { (RWF) initials
OR RF
Craig Forster
Dani Or
David Ferrill
Alan Morris
Jason Heath + Cynthia L. Dinwiddie

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11/18/03

Attachment to CNWRA Scientific
Notebook 515. CLD, 11/18/03
New CD burned to include a referenced
photo on 06/04/04. Prior CD
destroyed.
- CLD

Note: XRD data files found on CD SNS15 \ XRD analysis (CLD, 11/18/03)

Table of Contents

Page

Page numbers on field notebook page crossed out to avoid confusion with page numbers on this notebook per Mabrito suggestion, RWF 10/7/02

CONTENTS	REFERENCE	DATE

WOU - Cabs
CRWRK
PF 10/7/02
KRS
2/11/02 - 2/13/02
* Unload Bishop samples from 2/10/02 Field Trip
* Unsnap from field - remove foam - begin prep for epoxy to thin section pieces
Remail from jim 2/13/02 - for details on sample cuts
* Download photos onto laptop w/ Nikon View
OR SZ ANALYSIS (cont.) 2/14
From Robbs → 1995, Graphical mean.
Cumulative Curve: $MZ = \Phi_{116} + \Phi_{50} + \Phi_{184}$

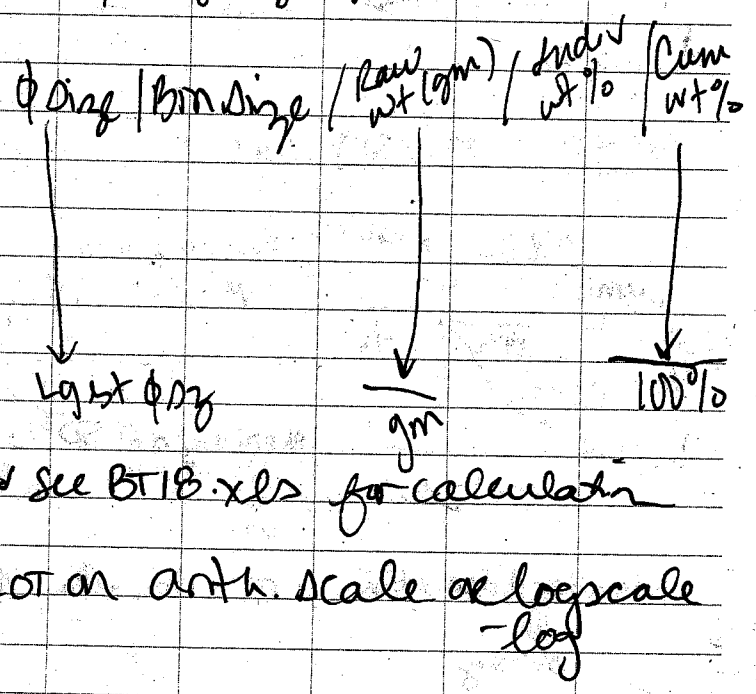
Median @ 50% Φ size
Standard deviation = $\sigma_T = \frac{\Phi_{184} - \Phi_{116}}{4} + \frac{\Phi_{116} - \Phi_{50}}{4}$
↓ starting
0.35 Φ = very well sorted
0.35 - 0.5 Φ = well sorted

RF 10/7/02

KKB
2/14/02

0.50 - 0.71 ϕ mod well sorted
0.71 - 1.00 ϕ mod sorted
1 - 2 ϕ poorly sorted
2.0 - 4.0 ϕ very poorly sorted
7.4 ϕ ext. "

Cumulative Curve
plot ϕ size against cum. wt%



RF 10/7/02 KKB
2/15/02
RWF 4/16/02

Using excel
* Create gray dist plots based on wt% data for samples BT 18 - BT 24 save files on laptop under gray analysis

Samples - KKB 3/01/02
re-epoxy
BT-8-01
BT-54-01
BT-53-01
YM-2-01
re-epoxy
BT-8-01
BT-53-01
YM-1-01
16C L to strike
16B L to strike

work completed in 12/01 rewritten from notes on looseleaf/see pages 92-93 in Sci notebook # 486

RF 10/7/02

KKB
3/1/02

Bishop samples -

- cut for thin sections ^{-16c} _{11 to strike}
re epoxy previous including BT-7-07 & BT-54-01

Prep - epoxy samples from trip to Bishop 2/02 w/ jim, david, alan

remove foam w/ pick on samples #: KKB 3/02/02
BT62-02
BT70-02 - epoxy frame cut + soft
BT64-02

Very large samples w/ major foam coat -> SUGGEST - in future wrap sample in plastic prior to coat w/ foam prep samples KKB
BT50-02
BT57-02
BT58-02

KKB 3/15/02
intended
RWF 4/16/02

USU / CNMRA
prep - epoxy
BT69-02
BT65-02
BT66-02

BT 54-01 strike 5 dip 7
BT 60-02 - orientation? see jim enans

BT69-02 - epoxy

BT64-02 - epoxy
lg - unnumbered - see jim
BT - 70-02

BT68B - strike & dip?
BT68C - " " dip 80?
BT68D - " " dip 80?

Witnessed & Understood by me, _____
 Date _____
 Recorded by _____
 Date _____

RF 10/7/02
 KKB
 3/27/02

BT08A -010°/80°
 BT07-02 015°/67°
 BT02-02 can't read writing?

KKB 3/25/02

EPoxy
 BT08B
 08C
 08D
 07-02

KKB 3/28/02
 epoxy w/ cheaper raka epoxy on lg samples

KKB #10/4/02
 KKB 4/4/02

brain size analysis
 with silve data only
 for samples
 BT18 - BT29 -
 use excel saved as:
 BT18.xls
 BT19.xls
 BT20.xls
 BT21.xls
 BT22.xls
 BT23.xls
 BT24.xls
 BT25.xls
 BT26.xls
 BT27.xls
 BT28.xls
 BT29.xls

all files printed
 on 4/5/02

met w/ jim wansen 4/5/02
 1) pot & field work may?
 2) work on report figures

Witnessed & Understood by me, _____
 Date _____
 Recorded by _____
 Date _____

CONTENTS		
PAGE	REFERENCE	DATE
Summary of work:		
	Continuation of work for CWLKA dealing w/ structural & hydrogeological characterization of the Bishop Tuff. Work in collaboration w/ Randy Feders, Cindy DinWiddie, & David Ferrill of CWLKA. Emphasis of map research focuses on fracture & fault systems within the Bishop Tuff as a means to understanding the fracture systems & how they may control fluid flow in the unsaturated zone. Structural characterization & detailed fracture data will be used to provide constraints on the hydrogeologic data & permeability tests run by Randy Feders & Cindy DinWiddie.	

Bishop project
 USU - KKB

* gas rate is now 36.5 ft per mile

KKB 2/11/02
 Brain Size Analysis plots
 create automatic mean plots using excel to determine grain size & sorting relationships

Using Bobbs, 1995 as reference for methodology

Note! - plots were graphed using grain size in mm and not ϕ size - need to plot as ϕ (Lx) of ϕ size in order to determine graphic mean, standard deviation etc.

2nd cover added 4/10/02 RF
 to pages 5-65

Samples -
 10-epoxy
 BT-8-01
 BT-54-01
 BT-53-01
 Ym-2-01
 Ym-1-01
 10 C 1 to strike
 10 B 1 to strike

KKB 3/01/02
 KKB 5/1/02
 epoxy methodology:
 ① clean sample
 ② mix 15ml of epoxy with 1.5cc of curing agent & touch of blue dye - stir for @ least 1 minute
 ③ create plate for sample w/ tin foil - pour epoxy over sample
 ④ vacuum for 3-4 hrs
 ⑤ repeat KKB 3/12/02 til epoxy surface is smooth
 ⑥ Bake in oven for 8 hours +
 ⑦ remove from oven and let cool
 ⑧ sample is ready to cut.

cut for thin sections
 10 C 1/1 to strike
 BT-9-01
 BT-54-01

prep samples / remove from
 BT-62-02
 BT-70-02
 BT-64-02
 BT-56-02
 BT-57-02
 BT-58-02

usu
 KKB 3/15/02
 prep/apply samples
 BT-59-02
 BT-65-02
 BT-66-02

KKB 3/19/02
 BT-54-01 5/7
 BT-60-02

3/20/02
 BT-62-02 epoxy

3/22/02
 BT-64-02
 BT-63
 BT-70
 BT-68B
 BT-68C
 BT-68D

usu -
 BT68A-010/80
 BT67-02-015/67
 BT62-02-

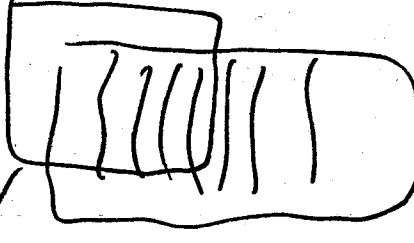
KKB 3/23/02
 TO DO FOR → KKB 4/5/02
 - print or size plots
 - work on paper figures
 - meet w/ jim wrt to project

epoxy BT68B
 again 68C
 68D
 67-02
 KKB 3/25/02

3/28/02
 epoxy w/ cheaper vaka
 epoxy on lg samples
 BT-70-02

usu
 KKB 4/8/02
 epoxy samples
 BT-60-02
 BT-61-02
 BT-55-01 195/74W
 Chalk core
 Fault area
 BT-62-02

4/10/02 KKB
 Cut samples for thin section
 BT-68D
 BT-59-01
 BT-52-02
 BT-69-02
 BT68A - epoxy
 BT68C
 BT-61-02
 BT-67-02

epoxy
 Fr: surface

 cut area

USU KCB
4/10/02

email from jprevans w/ figure
list outline and descriptions
w/ list to do:

- Fig 36 - pavement maps
- 4 - photos of tracer tests @ borrow pit
- 5 - Crucifix photos
- 6 - Crucifix map
- 10 - Grp analysis
- 11 - Xrd

4/12/02 KCB

Scan pavement maps A-G in borrow pit area using HP Precision Scan Pro. Save files to zip disk in photoshop 5.0 -

- pavement A = pave A .psd
- B = pave B .psd
- C = pave C .psd
- D =
- E =
- F =
- G = pave G .psd

USU KB
4/12/02

sample prep -
sample inventory for Feb 2002
trp - save as word file
SampleInventory.doc

sample prep re-
BT-68A cut

USU 4/13/02

open pavement .psd files and save into illustrator 9.0 on the imaclaptops - see page 144 of Sci. notebook #486

orient ea pavement w/r/t orientation @ outcrop

pavement A - TOP	Left 0°	Base 105°	Left 0°	Base 098°
pavement B -	Left 1010°	Base 102°		
pavement C -	Left 215°	Base 105°		
pavement D - TOP	Left 010°	Base 101°		
pavement E -	Left 014°	Base 100°		
pavement F -	Left 0°	Base 100°		
pavement G -	Left 005°	Base 104°		

USU - CNWRA KCB 4/13/02
* pavement C doesn't show up as well - may need to rescan image

Thin Section prep. KCB 4/15/02
cut - BT-57-02
BT-68B
re-epoxy BT-56-02
BT-66-02
BT-58-02

KCB 4/24/02
* received epoxy from petropoxy
* mailed thin section prep to spectrum petrographics
samples: fully prep & sent 16 samples

- BT-56-02
- BT-57-02
- BT-59-02
- BT-59-02
- BT-60-02
- BT-61-02
- BT-58-02

USU - CNWRA KCB 4/24/02
List (cont.)

- BT-62-02
- BT-65-02
- BT-66-02
- BT-67-02
- BT-68A-02
- BT-68B-02
- BT-68C-02
- BT-68D-02
- BT-69-02

sample prep - KCB 4/26/02

epoxy BT-70 w/ thin section epoxy

orient & epoxy BT-55-01

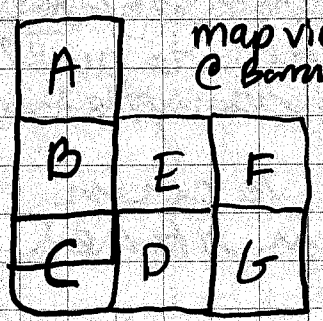
epoxy - BT-63 & BT-64 02

- BT-55-02
- BT-63-02
- BT-64-02
- BT-70-02

RF 4/2/03
Wsu
KKB 4/29/02
meet w/ jim evans -
- discuss plans for proposed bishop field work
- more data @ Lavers quarry / Chalk Cove
5/2/02
KKB

Backup of all files to date onto Sony CD-700MB
* BISHOP I - includes files from 7/1/01 to 4/29/02

RF 4/2/03
Wsu
KKB 4/30/02
- 5/1/02
pavement map @ bonwpit site
- maps in a.i. files will be oriented relative to North = 0°
N ↑
map view @ bonwpit site



Note - A was completed in 7/01 and B-G were completed in 2/02
- there is some overlap between pavement A & B which will be aligned in final pit pavement map
illustrator file

RF 4/2/03
Wsu / CHINA
KKB 5/1/02
sample map - epoxy BT-55-02 -
** NOTE Break in sample prep!
Vacuum is not f(x) properly pressure is not achieving desired levels to pull epoxy into sample -
order new vacuum from chem stores

US4
KKB 5/3/02
pit pavement files are very large and cannot be grouped as 1 file to allow illustration need to separate & complete each one first before joining

RF 4/2/03
Wsu
KKB 5/3/02
pit pavement map files in a.i. -
N ↑
S ↓
pit b & c - rotate to avg. 12.5° orientation of 12.5° to get fit between two maps
Note - reduce original by 75%
pit d & e - still do

pit f & g - still do

• emails from Cynthia, David, & jim - wrt to trip plans
TO DO - talk to Kirk Halford w/ BLM access & set up meeting to det. if any potential archeological impacts of our work
ALSO - LADWP permit?

Recorded by

Recorded by

RF 4/2/03

WMM

KCB 5/7/02

- epoxy BT-55 again but new vacuum hasn't arrived yet
- use old just to keep sample from fully hardening
- email C. Dinwiddie - Kirk is out of town until 5/20/02
- set up meeting for 5/21/02
- planning another field trip in June

pit pavement maps - computer keeps crashing turn virtual memory off in attempt to increase memory to address illustrators

okay RF 4/2/03

RF 4/2/03

WMM

KCB 5/8/02

- email from Kirk Halford - meet 5/21/02 @ 785 N main Suite E Cottonwood Plaza Bishop, CA

KCB 5/10/02

Discuss w/ Jim - proposed work @ Lovers Quarry (Chalk Lake) involves traverses w/in the hanging wall in two units - examine fr/ft characteristics changing from non-welded to ^{more} partially welded to ^{more} densely welded - Qual. fault zone looks like funnel w/ a zone of frac. in potential to welded sequence

* Begin to organize & rename digital photos from 7/01; KCB

RF 4/2/03

USU

KCB 5/10/02

- email from Cynthia proposes field work June 10-21st in Bishop

Test perm @

- site 1 - horn pit
- site 2 - crucifix
- site 3 - pleasant valley Dam
- site 4 - N side Horton Creek
- site 5 - Lovers Quarry
- site 6 - Pumice Quarry

KCB 5/13/02

- remove foam from BT-70
- epoxy w/ slow cure and leaving outside of vacuum to cure

- review & rename digital photos 5/21/02 from 7/01 - Lovers Quarry

- orig. Dig. # ↓ rename = Chalk Lake
- 976 - C core flt
- 977 - C core damage zone - Jim for scale
- 978 - C core damage zone 2
- 979 - C core damage zone 3
- 980 - C core top half
- 981 - C core

RF 4/2/03

USU -

KCB 5/15/02

- organize and clean field supplies kit - need to purchase - 1) tape, 2) sample bags, 3) sharpies

objectives of trip:

- 1) collect data @ Lovers Quarry
- 2) meet w/ Kirk Halford on 5/21/02
- 3) Det. sites that are on LDWP land to notify endy
- 4) sample & fr data @ crucifix + photos of same
- 5) sample from welded units above fault

pack field supplies - leave for Bishop P.M. 10/16/02 Drive 136 mi - 2.5 hr

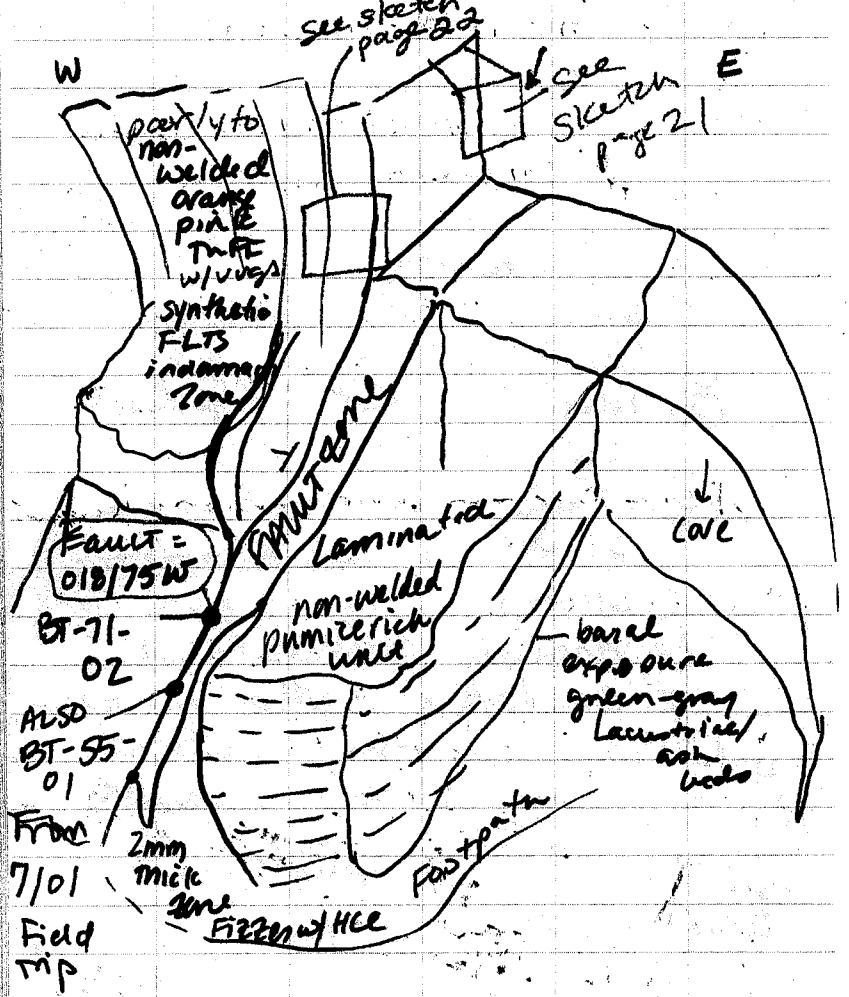
- email from Craig Foster wrt to June proposed field trip & field supplies
- Drive to Bishop from KCB 5/17/02 Rush Valley

Recorded by

Recorded by

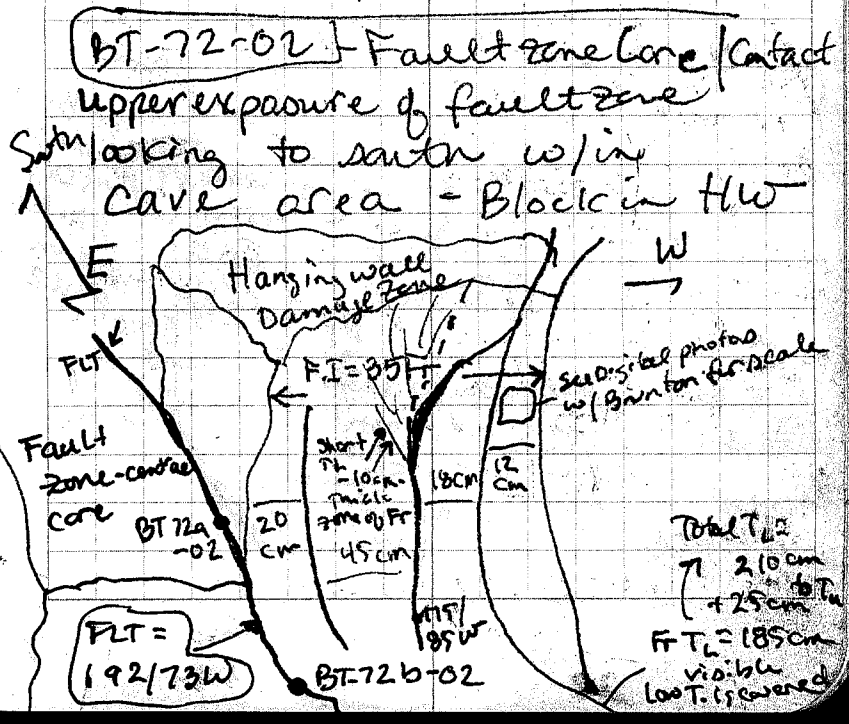
Review photos from previous CCB 5/18/02 keys
of trips to plan areas of new data collection
RF 4/2/03
BISHOP
KCB 5/19/02

Chalk Cave - 3D view - Sketch not to scale



RF 4/2/03
Chalk Cave / Bishop
KCB 5/19/02

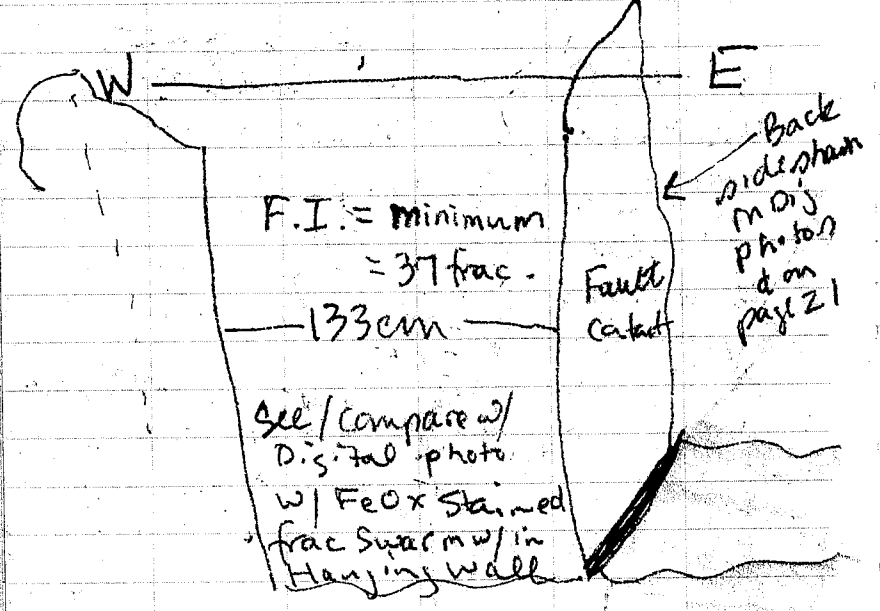
- Sample BT-71-02 - run xrd
- Fault surface is distinct giving trim (up to 3mm thick) smooth to rough - straight to more curvilinear - and locally filled with white calcine type material that fizzes w/ HCl test.



RF 4/2/03
Bishop
KCB 5/19/02

Fault Slickenline Data →

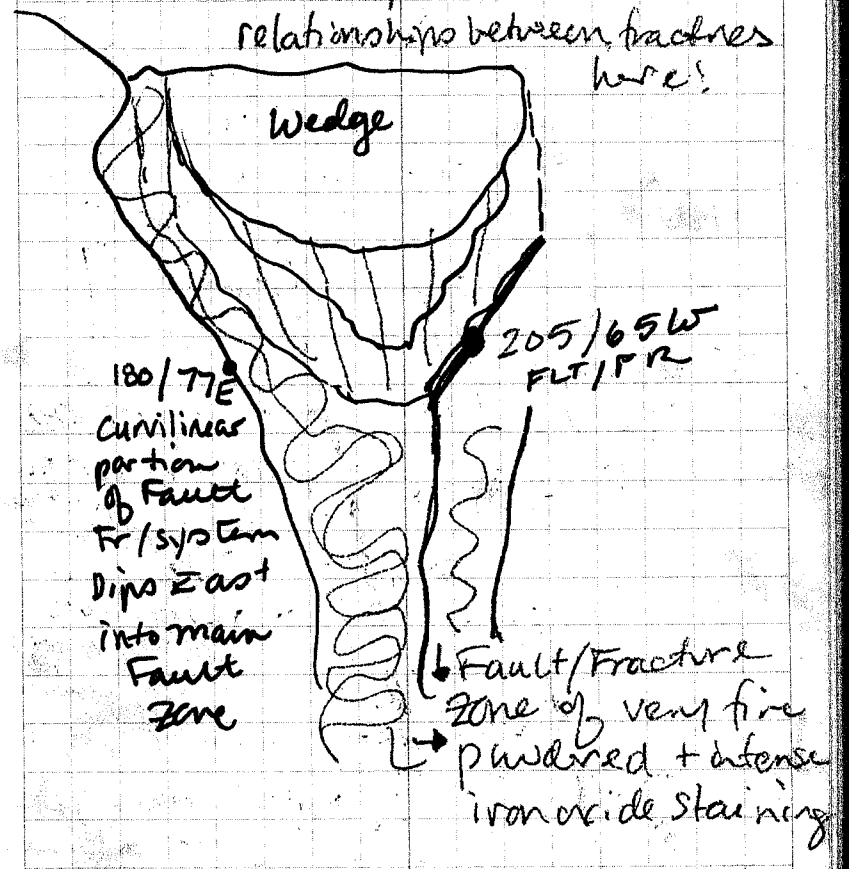
- Upper portion of Fault =
- 1) 192/73W Rake = 192°
 - 2) 182/72W Rake = 182°



RF 4/2/03
Bishop-Chalk Cave
KCB 5/20/02

Wedge w/in Fault zone - refer to digital photos

W _____ E
and map out in detail relationships between fractures here!



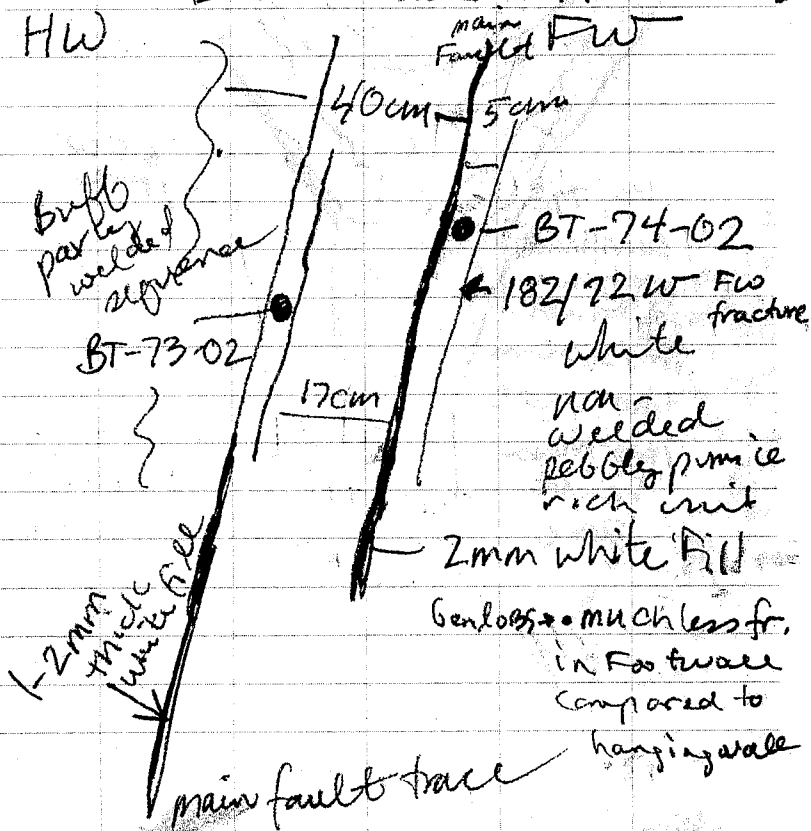
24 RF 4/2/03

Chalk Cove, Bishop 5/20/02 KKB

Faultzone Sampling for Xrd on grain size analyses

w/in first steps pitch

Before slope & changes between lower & upper benches

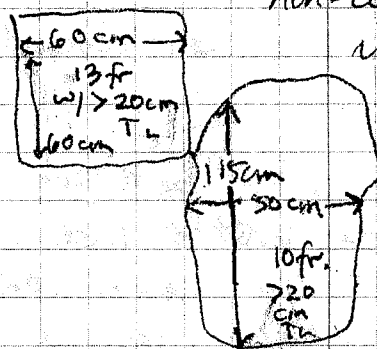


RF 4/2/03

Chalk Cove, Bishop 5/20/02 KKB 28

Below alluvium there are exposures of green-gray laumontine ash beds in the footwall of the chalk cove fault while these beds are not part of the tuffs in the HW & FW they have similar characteristics to basal surge deposits

a series of digital photos of frac intensities were taken for comparison to other non-welded unit



in the footwall & for hanging wall unit exposure is in footwall only but likely underlies mod pink orange unit in HW as seen by discolor to green of weather slope

28 4/2/03 RF

Chalk Cove 5/20/02 KKB

* attempt to follow trace of fault up the slope - fault is visible and characterized by polished slick surfaces w/ adjacent fracturing following parallel J & @ 10 & S to fault

follow fault for @ least 60m up slope after which zones of rubble & boulders and weathering cover trace - it is hard to follow & cant really detect w/in ashymy welded unit

Fault @ chalk cove - central between two 2mm distinct relatively planar fault surfaces is very friable; sandy - as if cement was leached or grain comminution processes are dominating

RF 4/2/03

Crucifix Site 5/20/02 KKB 27

→ on a storm moving in - very windy - sand blasts in the eye - Fun!

- Look @ this site - Things to think about -
- 1) how fr relate to fault zone (s)
 - 2) what are behavior of fr. w/in fault zone (s)
 - 3) are these random, highly variable frac sets, or regular sets w/in ftz
 - 4) scaling issue

* using digital photos to continue measure fracture intensities into hanging wall

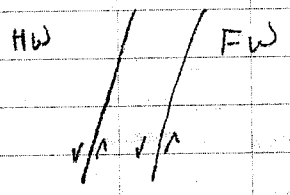
* take digital & print photos to create photo mosaics

RF 4/2/03
Bishop -

KCB
5/21/02

Chalk cave site

sampling - for grain size distribution
test for cementation



- BT 78 - a → use BT-55 or collect new sample HW
- b → core
- c → FW

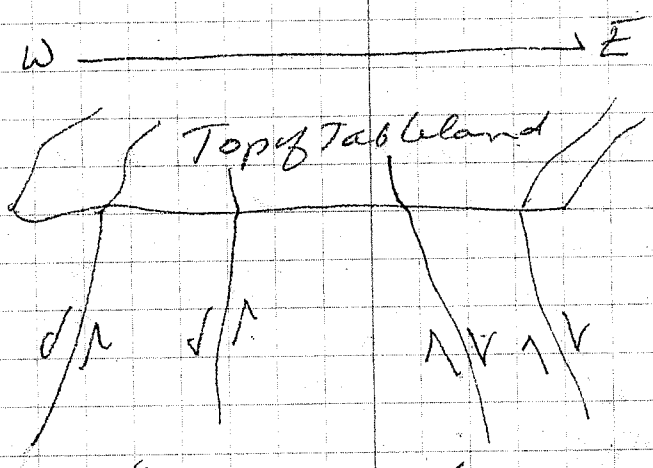
Crucifix

- BT 75a - HW
- 75b - core
- 75c - FW

RF 4/2/03

KCB
5/21/02

Bishop



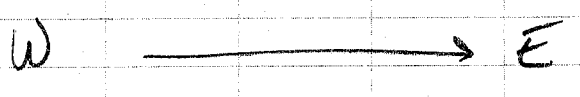
regional scale faults

- Keep in mind while working in this area
 - how can we represent what we see @ regional scale to microscopic, macroscopic, & microscopic scales.
 - Document fault system @ various scales w/ photographs and measurement data
- general observations show a positive correlation between regional → micro elements

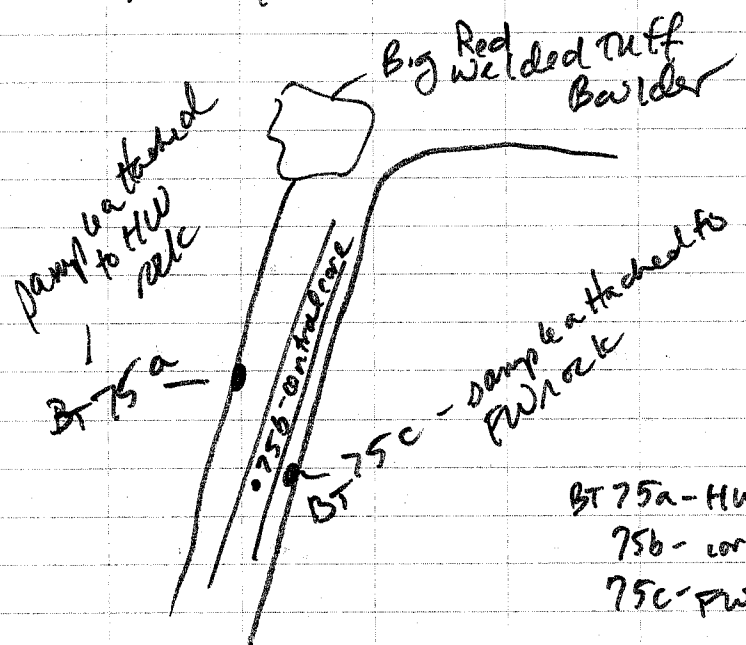
RF 4/2/03

Bishop - Crucifix site

KCB
5/21/02



see digital photos to locate samples from sketch



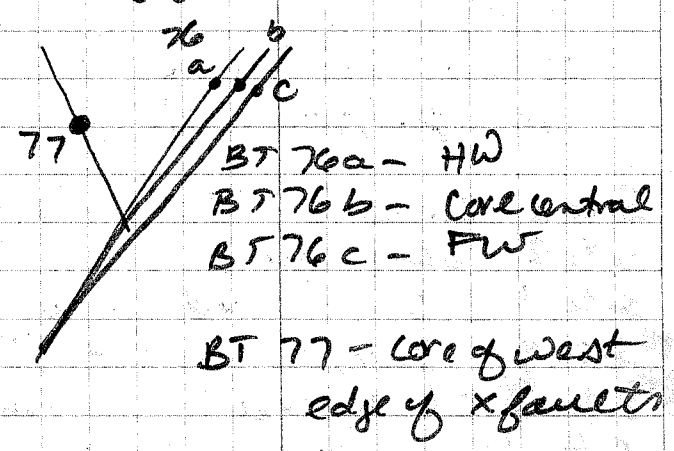
*Take digital + print photos for mosaics

RF 4/2/03

Bishop - Crucifix

KCB
5/21/02

crossing faults (x faults)



Lavers Quarry = Chalk Cave

- BT 78a - HW
- 78b - core
- 78c - FW

BT 79 - HW Lithology

BT 80 - FW Lithology

*LOOK IN LITERATURE FOR FRACTURES/DEFORM BANDS IN NON WELDED TO PARTLY WELDED TUFFS

32 4/2/03 RF
Brooks

KCB
5/21/02

BLM office - meet w/ Kirk
Haeferd
- obtain site permissions
for proposed July fieldwork

- Site 1 - Borrow Pit - BLM owned - OK ✓
- Site 2 - DWP owned
- Site 3 - DWP owned - Pleasant Valley
- Site 5 - DWP/BLM border - BLM OK ✓
- Site 4 - Horton Creek - DWP owned
- Site 6 - private or BLM owned
pumice quarry

apply for permits through Larry
also apply w/ La DWP

*leave 12 noon for Drive home!

RF 4/2/03
KCB 25
5/22/02

uou -

emails from Craig & Jim -
they will no longer be on
project due to COI

emails from Cynthia
potential field data
June 9th - 24th

5/25 - 6/4

- emails - filling out paperwork
related to COI, funding,
etc.
- xrd - prep - crush rocks 5/28/02
- run xrd tests 5/30 - 5/31/02
- new vacuum pump arrives
for spacing samples

RF 4/2/03
uou / Smithfield office

KCB
6/4/02

Discuss Project Direction
Conference Call w/ -
Cynthia Dinwiddie
Randall Feders
David Ferrill
James Peters
Kelly K Bradbury

Notes

- chalk cave in Igze deposit + a lower part of
ignimbrite sequence - see Wilson & Hildredge, 1994
- miniperms will use ~40 lbs w/ nitrogen cylinders
- bring backpack to carry
- collect background & fault zone data @
Chalk cave w/ miniperms.
for each air perm need map location
* make photomosaic for emcrite
and chalk cave
- site 1 in FW of fault
- site 1, 6, 4 - nonwelded surge dep.
- see Geol., 1998⁷⁻¹⁰ strat of basal seq.
- Jim - take jales stuff or tape to
measure vertical strat column just
west of emcrite - detailed
rock descriptions + field data

RF 4/2/03
KCB 25
6/4/02

field trip planning

- Cindy
- Don
- David
- Randy
- Kelly

June 16th -
27th

• maybe bring xrad drill + nutting

KCB
6/10/02

grain size analysis -
fund error in plots -
the x axis needs to be fixed
φ sizes are not correct
see Print BT18-BT29.xls
change φ sizes as follows:

in x axis grain size in mm	new φ size
4	-2
2	-1.0
1	0
0.5	1.0
0.25	2.0

next → replot w/ new φ size to perform calculations

Note that photos are on an associated CD, path name: SN515\Photos Page 22\photosX-02\photosX-02\X.15 month. CLD, 11/17/03

38 RF 4/2/03

1003
6/11

sample prep/organize - create/update
sample inventory - box
all samples that have been
prepped for thin section

RF 4/2/03

KKB
6/12/02

chalk cave / lower quarry photos

ccave 1 - FW - lake bed deposits

2 - " "

3 - " "

4 - " "

5 - " "

6 - " "

page 16, this SN

CLD, 11/14/03

Organize & rename digital
PHOTOS →

Start w/ 5/02 pictures

- Crifix 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

Wedge x bet

W wedge x bet

bet + gauge

waterup 1

waterup 2

waterup 3

waterup 4

caliche fr - w atemp

waterup

HW

damage

zone

caliche filled

fractures

2/02 trip -

- 164 - narrow pit view
- 165 - narrow pit w/ ft
- 166 - narrow pit w/ ft 1
- 167 - " " 2
- 168 - b pit caliche fr
- 169 - b pit caliche fr
- 170 - b pit pave 2
- 171 - b pit mills
- 172 - ccave view
- 173 - " " 2
- 174 - " " 3
- 175 - " " 4
- 176 - " " 5
- 177 - " " 6
- 178 - " " 7
- 179 - " " 8
- 180 - " " 9

- 181 - crifix #1
- 182 - crifix #2
- 183 - crifix #3
- 184 - crifix #4
- 185 - crifix #5
- also - crifix #6

also, crifix #1 fr 1 2 clod
crifix #2 fr 2 3 11/17/03

- 186 - crifix #7
- 187 - crifix #8
- 188 - crifix #9
- 189 - crifix #10
- 190 - crifix #11
- 191 - crifix #12
- 192 - crifix #13
- 193 - crifix #14
- 194 - crifix #15
- 195 - " " 1
- 196 - crifix #16
- 197 - crifix #17
- 198 - crifix #18
- 199 - crifix #19
- 200 - " " 2
- 201 - crifix white bed
- 202 - dye test remaining
- 203 - " " 2
- 204 - fish slough dis map
- 205 - " " 2
- 206 - " " 3
- 207 - fish slough ft
- 208 - delete poor
- 209 - ccave view 1
- also - fish slough 2 clod 11/17/03

Recorded by

File name

38 4/2/03 RF

KKB
6/12/02

Digital photo organization / rename

Hortencreek - 7/01 photos

KKB
6/13/02
RF

- 210 - n + tm
- 211 - scientist
- 212 - strat color
- 213 - table view
- 214 - table view
- 215 - " "
- 216 - " "
- 217 - tng hill
- 218 - B pour
- 219 - B pour
- 220 - B pour
- 221 - " "
- 222 - " "
- 223 - " "
- 224 - photo
- 225 - " "
- 226 - " "
- 227 - " "
- 228 - " "
- 229 - " "

7/01

chalk cave

976 - ccave 1

977 - ccave 2

978 - ccave 3

979 - ccave 4

980 - ccave 5

981 - ccave 6



DSCN0895.JPG
(688 KB)

some questions answered:

1. i think maybe a folder of photos didnt get copied to your cd...here is a the pic 895 or the one that had been relabeled hcbedd...which might be on my laptop as hc bedd but have to check. ill try to figure out what happenend. could you send me a list of the photo folders contained on the cd you have. 2. three pics from page 111 of notebook 515...label A (up left pic)-locations of crucifix fault rock samples for whole rock analyses B=(up right pic)-upper crucifix outcrop with location of rock sample in green ash sequence, jim evans for scale; and C=view looking north of crucifi fault zone, lower outcrop 3. you can a fax of my notebook pages that need clarification to kelly bradbury #435 797 9605.

adios,
kkb

relevant
email
added on
6/10/02,
CLD

Page 23 photos 7-01
chalk cave
file name
CLD, 11/14/03

SN 515\Photos

- 918 - b pit dye test 3 clod
- 920 - " " core
- 922 - " " core 2
- 925 - " " core 3
- 927 - b pit dye test jim
- 930 - b pit dye test view
- 931 - pave sample close
- 932 - pave sample
- 933 - pave sample close
- 934 - sample win pave

file location?
same as about
CLD, 11/17/03

SN 515\Photos Page 23\photos2-02\regional pics\file name CLD, 11/17/03

3/4/2/03 RF

KCB
6/12/02

KCB
6/13/02
RF
4/2/03

Digital photo organization / rename

- 210 - mtn
- 211 - Scientists
- 212 - Strat column
- 213 - table view 1
- 214 - table view 2
- 215 - " " 3
- 216 - " " 4
- 217 - long hills
- 218 - B pool
- 219 - B pool
- 220 - B pool
- 221 -
- 222 -
- 223 -
- 224 -
- 225 -
- 226 -
- 227 -
- 228 -
- 229 -

PHOTOS NOT GOOD DUE TO OVEREXPOSURE
f/or bright light

location?
CLD, 11/14/03
↓
Photo is
now located
on the
same cd
w/ same
pathname
as the
following figs.

CLD, 11/14/03
also
CLD, 11/14/03
SN 515 Photos Page 23 photos 7-01 narrow pit x filename

- 7/01
(chalk cave)
- 976 - cove flt
- 977 - cove fw
- 978 - cove d mpy 2
- 979 - cove d mpy 3
- 980 - cove d mpy jim
- 981 - cove perm test

SN 515 Photos Page 23 photos 7-01
chalk cave
filename
CLD, 11/14/03

6/13/02

Hortencreek - 7/01 photos

- 895 - hc bed
- 896 - hc bed randy
- 897 - hc feox beds
- 898 - KCBS 6/13/02
- 901 - hc feox close
- 902 - " " 2
- 903 - hc flt 1
- 904 - " " 2
- 905 - " " 3
- 906 - hc infil test
- 907 - hc creek
- 908 - hc creek 2
- also - hc creek 3

SN 515 Photos Page 23 photos 7-01 Hortencreek
CLD, 11/14/03
filename

Barrmpitsite

- 909 - b pit 1 2 infil test
- 910 - b pit infil test
- 911 - b pit 3 dge test
- 914 - " " 2
- 915 - " " 3
- 917 - " " 4
- 918 - b pit dge test 3 close
- 920 - " " core
- 922 - " " core 2
- 925 - " " core 3
- 927 - b pit dge test jim
- 930 - b pit dge test view
- 931 - pave sample close KCBS 6/13/02
- 932 - pave samples
- 933 - pave sample close
- 934 - samples win pave
- 935 - b pit 2 infil test jim
- 936 - φ del. poor qual
- 939 - pit 3 1/2 infil test close
- 940 - φ
- 941 - pit 3 infil test - close

CLD, 11/17/03

file location?
same as above.
CLD, 11/17/03

SN 515 Photos Page 23 photos 7-02 regional pic x filename CLD, 11/17/03

TITLE

RF 4/2/03

KKB
6/16/02

ENWER/BISHOPWORK

June 16 2002 → Leave For Bishop, CA from
KKB California UTAH @ 12 noon
6/16/02 (1600 miles) Arrive 10pm

KKB
June 17 2002 → meet Cindy Dinwiddie
@ 8:30am

- pick up field supplies - mammoth
- permits from LADWS
- review field sites
Chalk Cove, Crucifix,
Borrow Pit
- Leave + HOTEL 4:30pm.

* SAMPLING STARTS w/
ST-BI-02 FOR JUNE
FIELDWORK

CCOVE FAULT MGMTS.

w/in Borrow cove south of main work area
+ it contact is 5cm fault core
orientation = $204^{\circ}/76^{\circ}W$

@ 2.9m south of pt 0m on CCHW1
parallel/along fault measure = $180^{\circ}/68^{\circ}W$

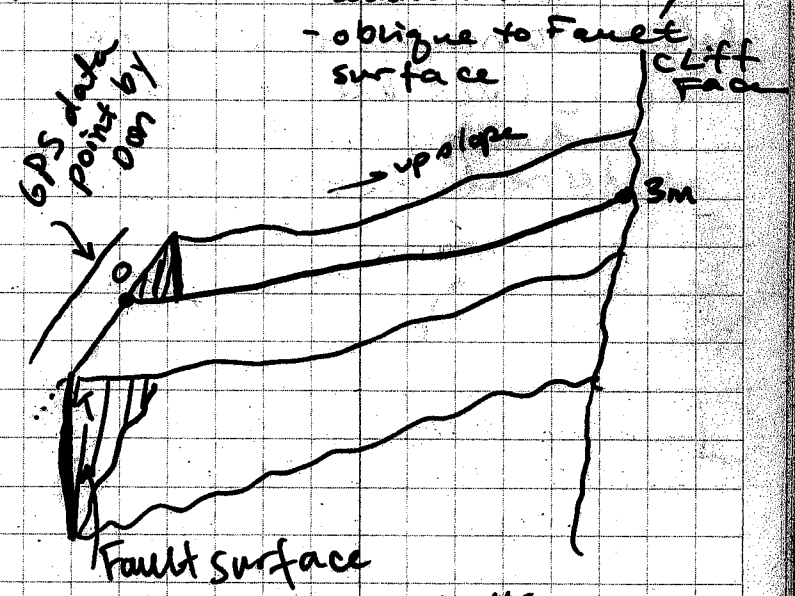
RF 4/2/03

KKB
6/18/02

BISHOP

7:30am - begin field data.
Tuesday → arrive @ Chalk Cove (CC)
w/ Randy Feders, Cindy Dinwiddie,
David Ferrell, Don Bannon

First transect @ CC - CCHW1 (0-3m)
permeameter



- located in HW
- oblique to Fenet surface
- 0-3m tape trend @ 284°
- see CCHW1 sketch
- run scanline from 0-3m
- + CCHW1 -
- measure T/P of scanline
- * note Litnic clast ring

RF 4/2/03

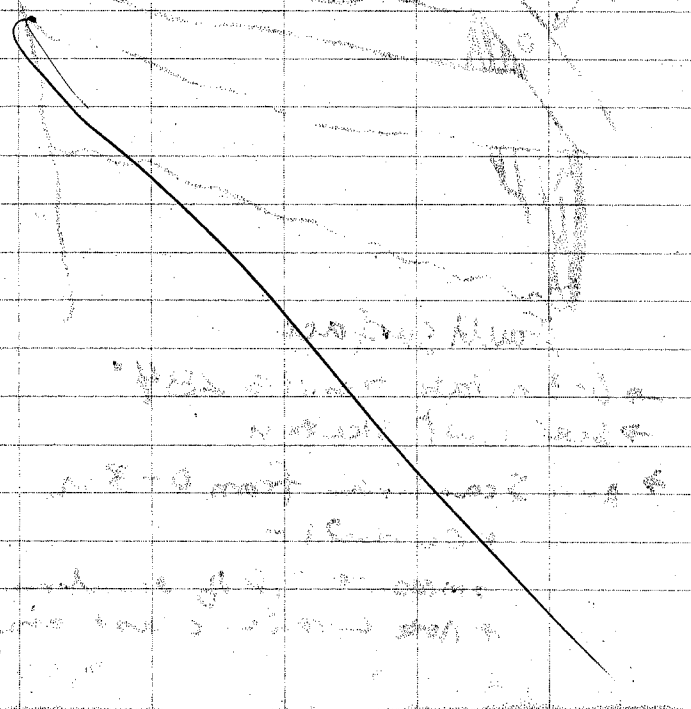
6/19/02-6/18/02

* Scanline
HWCC1 - 0-3m

KKB

Station	Fr or Fr orient.	estimated T _L	Thickness/Aperture
0	190/73W FLT RWF for KKB 10/7/02	> 17m	2mm
35cm	199/85W Fr HW Fr 1?	> 8m	1mm
60cm	Fr	> 8m	1mm

Refer to maps for remaining
Fr T_L (visible) and station
location of fracture
intersection along tape



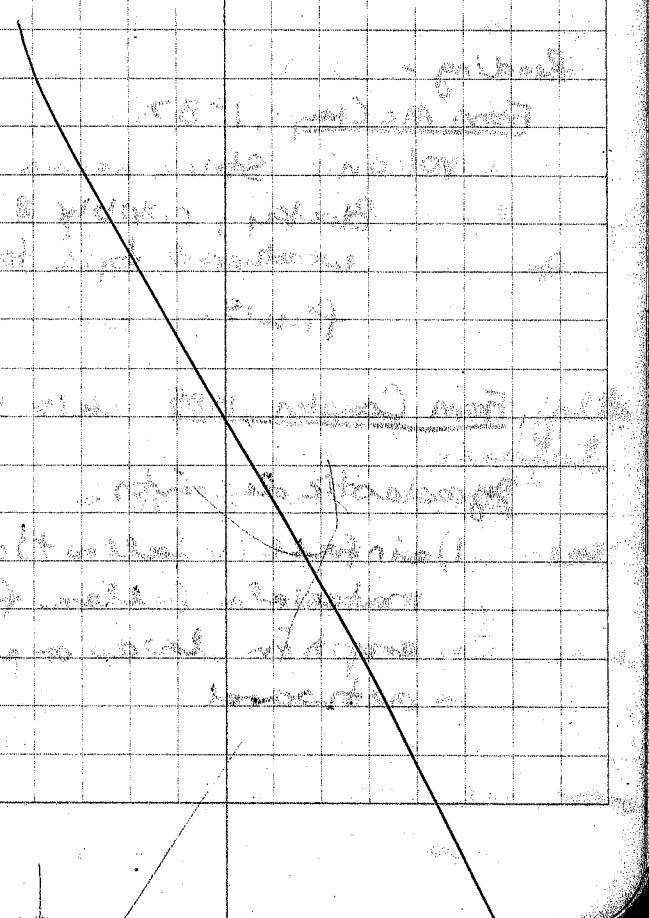
6/19/02-6/18/02

HWCC1 (0-3m)

RF 4/2/03

KKB

- other - slickens, Litnic clast ring; etc
- * see poroids CCHW1 (0-3m) # orientation trends
- * Tape trend & plunge - 0-1m = $284^{\circ}/47^{\circ}$; 1-1.5 = $281^{\circ}/36^{\circ}$; 1.5-2 = $285^{\circ}/35^{\circ}$; 2-2.5 = $284^{\circ}/37^{\circ}$; 2.5-3 = $283^{\circ}/27^{\circ}$;



RF 4/2/03
Bishop California
KKB
6/19/02

- Chalk case -
- map perm test sites for CCHW 3-6 m
 - measure T/P for 0-3m tape/scan line
 - Run perm tests w/ CCHW

Reading -
From McClay, 1987
Volcanic Strux terms:
Blocky, rotably & weathered tops to lava flows.

From Compton, 1985: on 13 volc. strux
pyroclastic deposits:
1) air fall (or fallout) deposits: materials fallen from high eruptive clouds or projected outward

RF 4/2/03
Bishop
KKB
6/19/02

- 1) (cont.)
- typically poorly to mod. sorted in volcano & well to very well sorted at increasing distances from it - become thinner & finer grained away from volcano
 - repeated explosions of different strengths lead to distinct strat. may be modified by creep & bioturbation

Plinian-type activity - air falls produced by unusually powerful but continuous gas blasts
can be recognized by a near vent facies consisting of a thick unstratified pumice layer that contains only mod. amounts of clasts finer than 1mm & sometimes grades coarser - upward

see in Bishop specimens

RF 4/2/03
CCHWA - Bishop, CA
KKB
6/19/02

- 2) Base Surge Deposits
char. by laminae that are typically cut into dune, antidune, & smaller sand wave forms near the volcano & are planar at greater distances from the volcano
- unlaminate dep. of poorly sorted clasts are abundant commonly forming elongate lenses in lee of antidunes

- 3) Ignimbrites (pyroclastic flow deposits produced by explosions)
* ash flows - median grain ≤ 2 mm
~ pumice fragments > 2 mm are common
* pumice flows - pumice fragments are predominant
* Block flows - mainly near volcano

* See Sheridan, 1979

RF 4/2/03
BISHOP, CA
KKB
6/19/02

CCHW scanline / strip map - See Map - includes both FW & HW of fault - located upwards from CCHW along fault trace

- Bishop Field KKB 6/22/02
TODO - ① measure visible trace of Ftz between two testing locations parallel to fault - + correct for slope &
- ② Sample Ftz lith. along this line and @ peaks / lows in perm. readings.
- ③ mosaic photo of upper fault zone to map fr/ft in detail
- ④ Fin. map CCHW 0-3m
- ⑤ map Ftz vert/horiz w/ 3 zones per HW/Ptz/FW

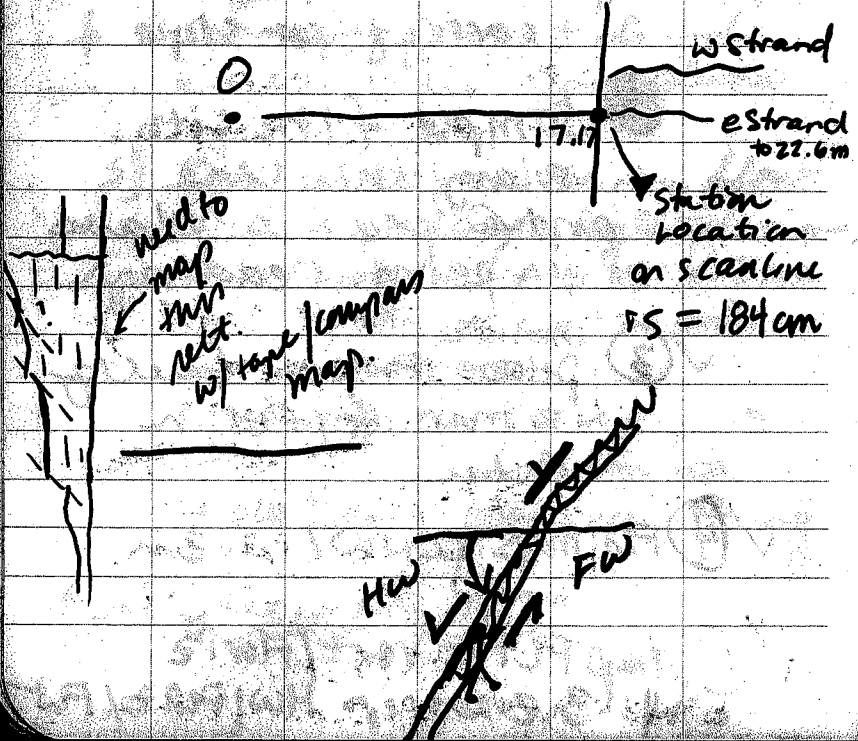
Recorded by

RF 4/2/03 KKB
 Bishop = Chalk Cove 6/20/02

* MAP OF FAULT ZONE connecting two testing areas & scanlines

Chalk Cove Fault connects CCHW1 to CC2

Distance of Fault is 0-17.17m between 2 scanlines continues \leq 22m



RF 4/2/03 KKB
 Chalk Cove - 6/20/02

→ see previous data page 22

Chalk Cove Fault zone

0m =

2m = 202 / 80 W polished slick surf w/ 1mm coat

3m = 197 / 70 W

@ 3m 2nd Fr/Fr surf begins II to main Fr

unpolished hummocky surface w/ lots abundant pumice fragments

3.75m = 199 / 75 W; 70° = rake

@ 5.3m polished w/ slicker 1-3mm coat

2 HW PTS 10 8um thick

5.65m = 201 / 78 W, 68° 1-3mm polished surface

@ 7m Fr zones w/ slicker westward from main fault strand

7.15m = 190 / 74 W

2mm thick coating semi polished hard to id slicker

@ 7.5m 7.6m = 193 / 78 W - w moot

this zone is 15um thick HW? fit/fr surface between 2 Frs

main Fr w/ polished surface = 194 / 73 W

9.0m = 197 / 87 W

between HW/FW w/ istng zone = 28cm

RF 4/2/03 KKB
 Crucifix / Crossing faults 6/20/02

Randy, David, Kees -

Decide on sample loci + Horiz distance

Collect in 2 beds

labor wavy white layer = ASH Bed

1 below wavy white layer = silty sandy pumice ash bed

(see digital photos)

Sample from within Crucifix fault eastward

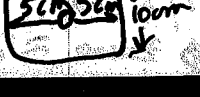
In Footwall to small

- offset fault east of wedge / crossing faults.

collect fr data w/in Beds & create area data for P.I.

- make 10cm by 10cm grid to place

over each hole - use grid to collect fracture data



Bishop

RF 4/2/03 KKB
 6/20/02

→ continue mapping CC2 beyond (North) of 17.17m scanline - see page 2 of CC2

- polero ds of CC2 area + digital photos

- even - download digital photos over in 6/02 folder for print

Friday in Bishop KKB 6/21/02

Map chalk cove fault zone in vertical profile

* Digital photos of upper fault zone + fracture in upper dip

Map fault zone core w/ digital photos

& tape measuring distances of core zone + sample

RF 4/2/03

Bishop -

KKB
6/22/02
ZI

Continue mapping Chalk cave faultz

① List of things to do zones -
* collect sample of fault zone gouge
block size & note volume

✓ map FITZ in detail + sample + note
types of material in the zone

BT-B1-02 - Footwall material
appears to be altered relative
to host rock - possibly FW
gouge 2cm thick

Test 4 xrd

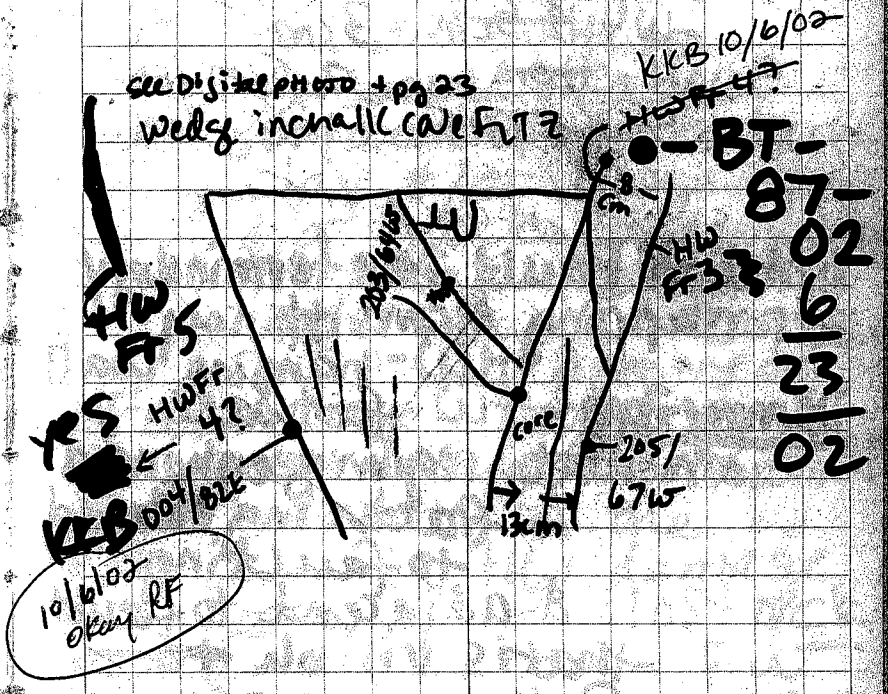
BT-B2-02 - two samples; 1 for xrd
one 4 thin section if
holds up during travel
- Fault gouge (central)
material

RF 4/2/03

Bishop-Chalk cave

KKB
6/22/02

* Continue mapping - sampling
David & Randy left this
morning so now it is just
Cindy, DM, & I



Recorded by

RF 4/2/03

Bishop-Chalk cave

KKB
6/22/02

Sample for H₂O content
from CCHW1.63

Sample CCHW1.63 dimensions -

W - 12.5cm	3cm	RWF for
H - 11cm	2.5cm	KKB
Len - 13cm		10/7/02

Notes on Fault zone terminology
for mapping & consistency

HW - hanging wall

Damage zone - FW - footwall
immediate region enhanced
fracturing related
to faulting
& adjacent to fault
that is visible to
@ the macroscopic
scale - horizontal
extent is typically
FW or HW core - gradational
boundary to host rock
(undamaged)

RWF for KKB 10/7/02

Bishop-Chalk cave

KKB
6/22/02

Gouge zone - Footwall - FW
- hanging wall - HW
- Fault core

~ distinct regions
banded by two
discrete fault
surfaces that contain
clay &/or gouge
&/a blocks of damaged
material found
w/in fault core
very intensely damaged

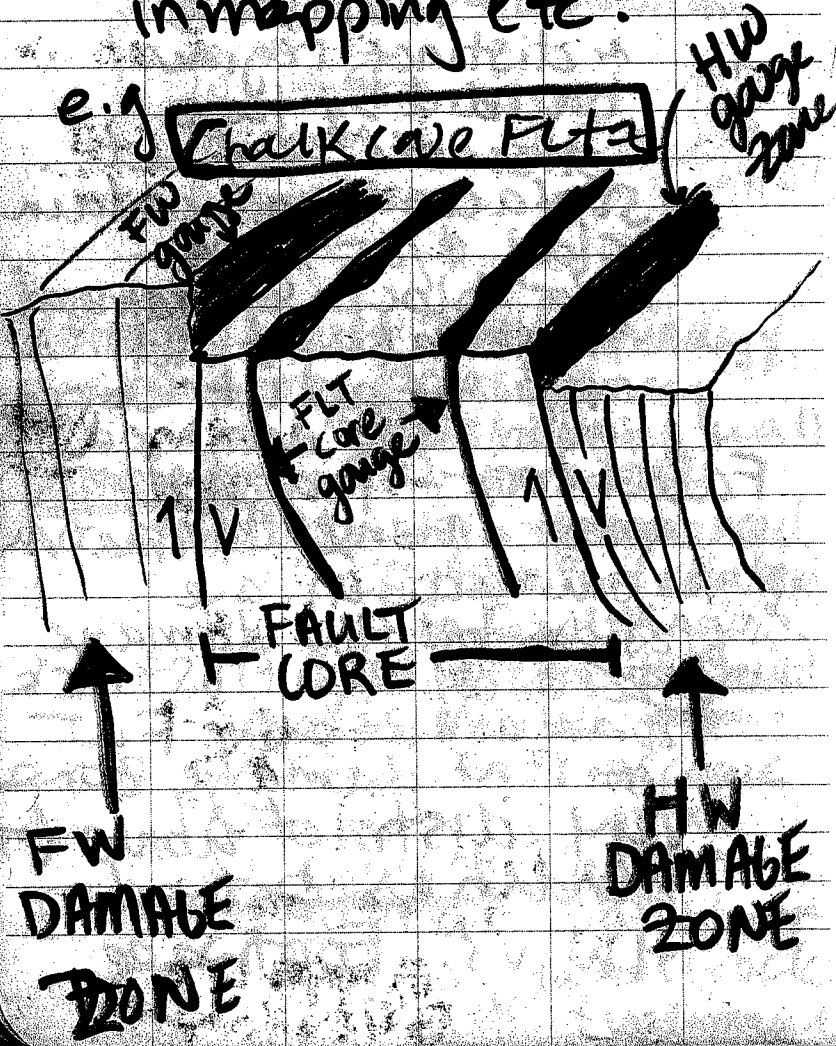
Fault core - region of
most intense deformation
banded on one
side by HW damage
zone or HW host rock
and other by FW
or FW damage zone
very distinct abrupt
boundaries between
HW vs. Footwall

RWF for KKB 10/7/02

Recorded by

RF 4/2/03 RF
58
BISHOP - ChalkCave 6/22/02 VCRB

Schematic of terms that will be used to describe fault zones in mapping etc.



RF 4/2/03 RF
58
BISHOP - ChalkCave 6/23/02 VCRB

- correlate HWFr 1-5 all way thru fault zone & on map.

- Sampling + orientations →
BT 83-02 - FW gauge? Xrd
block
wedge of mat 1
~ @ 10.4

BT 84-02 - FeOx stained Xrd
Fault gauge

BT 85-02 - FeOx
11-11.15m stained
Block

→ epoxy Btwn HWFr 1
for T.S. [HWFr 1
TOP ~ 5m
of exposure
B4 fails report

Project No. _____
Book No. _____
TITLE _____

RF 4/2/03 RF
58
BISHOP ChalkCave 6/23/02 VCRB

BT-86-02 - from 13.7m
Fault core gauge
2cm thick
- MR Xrd

BT-87-02 - ~14m
in fractured block
on West side of
Fault core
See page 53
HWFr 3 -

@ 16m - Fault orientation =
189/82W

(P.M) - load photos
in2 ChalkCave folder
6/02 into laptop.

BISHOP ChalkCave 6/23/02 VCRB RF 4/2/03 RF 58

Don & Cindy will
conduct perm tests
w/ Guelph perm.

CC HW1.64 → Btwn
540 & 540
on South side
of Scanline
CC HW1

Route for KRB 10/1/02

CC HW1 air perm
tests are finished
for CC HW1.65 will be
conducted in zone
where air perm data
was unavailable due
to lack of seal
~ between 1.3 - 2.7m
Hole @ ~ 2.10m

CC HW1.64 @ *WVF by KRB 10/1/02*

* Zone of intense fracturing E
Abundant red brown FeOx stain
on open surface @ higher exposure
on CC HW1 from 2.1 - 2.7m

Project No. _____
Book No. _____
TITLE _____

Project No. _____
Book No. _____
33

PC 4/2/03
 80 Chalk core KCB 6/24/02

* Digital photos of CCHW1
 0.3m.

Guelp sample
 CCHW1.6P1/2
 6cm x 4.5cm x 3.5cm
 loose mate
 intersect HW Fr 4

CCHW1.6P4
 still intact - have
 rammy measure upon
 arrival to Lab

CCHW.6P5
 13 x 9 x 3.5cm

zoom
 sample of CCHW1.
 @ 2.13m to ~ 2.165m

PC 4/2/03
 Chalk core KCB 6/24/02

@.6P5 - it was very hard
 to get a sample - core
 just to resist
 powder as soon as you
 try to work with it

on CCHW1 this corresponds
 to zone between
 2 - 2.7m of
 fractures filled/coated?
 w/ FeOx material

+ see same material &
 have trouble getting holes
 drilled for air perm @
 CC2 between 3.0 -
 4.0m

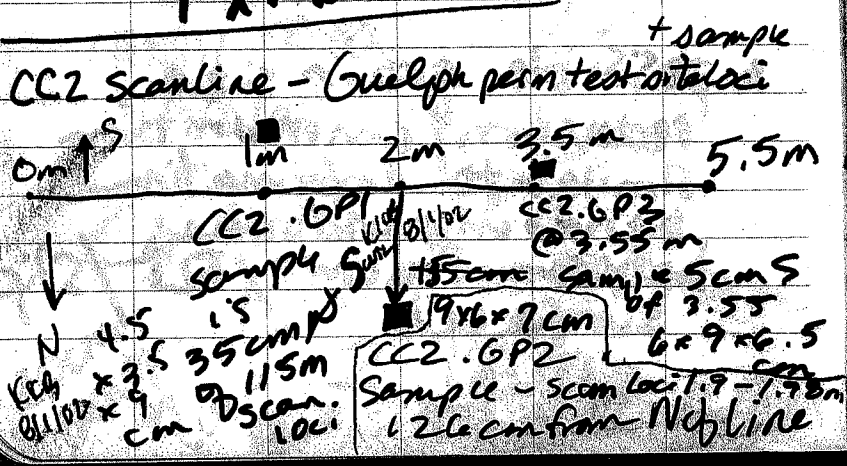
* possible grain size
 reduction / comminution
 similar to deformation
 bands in sandstones
 between fracture/FLT/slip
 surfaces

PC 4/2/03
 Bishop 6/24/02
 KCB

BT-88-02
 zone btwn FLT & Fr HW
 FT1

4-XRD RWF for KCB 10/7/02

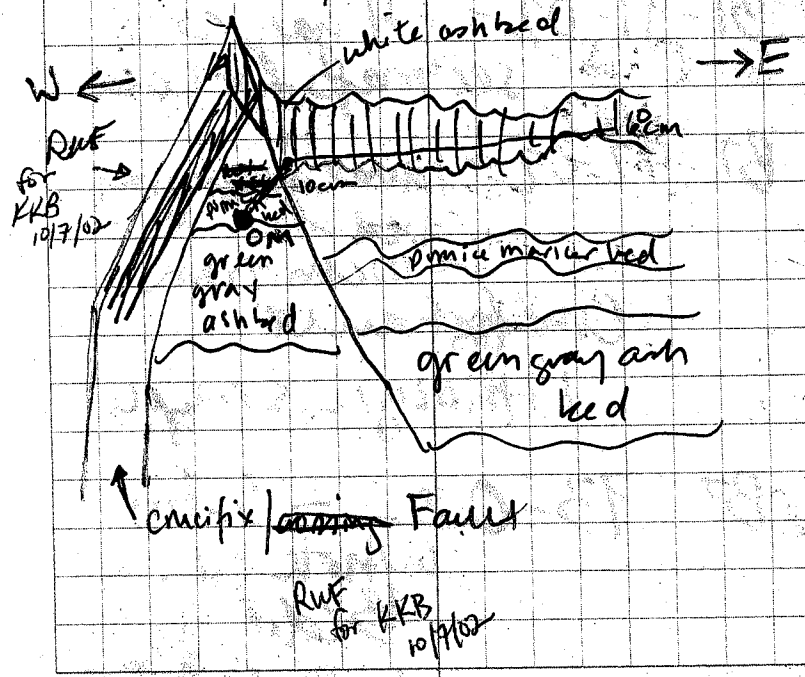
BT-89-02
 Clay gouge from FT
 core - 5cm thick
 @ CC2 map see
 Location
 4-XRD



PC 4/2/03
 Crossing faults Bishop. crucifix site KCB 6/25/02

* Begin air perm tests @
 crucifix / cross fault today

* line is set following white ash
 bed - see mapping & photos
 initial idea for station
 spacing is 0.25m
 w/ 0 set as near as possible
 to crucifix fault



Recorded by

RF 4/2/03
KKB
Bishop Crucifix / Crossing faults 6/26/02

* Continue mapping scanline

Sample - BT-90-02
FH gauge - scanline
Loc 9.6m

BT-91-02 - FH gauge @ 9.6m
see map for loc

BT-92-02 - lower green gray
bed
~ 10cm from
Crucifix Fault
Lithologic sample

BT-93-02 - 5.1m
Whitish
Bed
Lithology

Recorded by

RF 4/2/03 85

Bishop KKB 6/26/02
Strat section - Volcanic Tableland

West of Crucifix / crossing faults

Sampling -
Unit A - BT-94-02
Unit B - BT-95-02
Unit B/C - BT-96-02 - intensely fractured
Unit C(a) - welded BT-97-02
Unit C(b) - welded BT-98-02

Bishop KKB 6/27/02

- give Craig new data station loc
4 eg 1 & 2
- Drive Home
wt/field mileage - 850 mi
+ phone = 610 mi
1460
Crucifix - Christina

✓ RWB for KKB 10/11/02
* chalk core - fracturing increases
upward along slope potentially
f(x) due to of lithologic change
from A into unit B

RF 4/2/03
USU KKB 7/1/02

- * Return field supplies to USU
- * organize samples -
xrd machine is down @ USU
- contact Pete Kolesar for estimate on how long this will be
- samples will be epoxyed for thin sectioning and all will be tested w/ xrd for mineralogy
- also samples from 5/02 from fault zones will be used for grain size analysis for sieving
- samples 94-98 need to be described in detail, for stratigraphic column w/ particular attention to degree of welding
- BT 90-94 - samples are from transect Cf 1-3 and for description purposes

Recorded by

RF 4/2/03 87

USU KKB 7/2/02

- epoxy BT-73-02 - place in vacuum chamber for 4 hours
Also prep for xrd
- prep samples for xrd: crush & grind w/ mortar & pestle
- BT-71-02
Chalk core
Fault zone core material
2mm thick fill
- BT-72a-02 - chalk core
upper fault - west edge
thin mm thick fracture w/ fill
- BT-72b - chalk core
East strand of mm thick fault core
- BT-74-02
BT-75a-02
HW of Crucifix fault
save some for grain size analysis as well

RF 4/2/03

HOME OFFICE Smithfield Utah

KCB 7/3/02

- Teleconference w/ Ranaj Fedars, Cindy Dincwiddie, and David Ferrill 10am MOT

TOPICS covered. TODO ->

* bet Sheridan paper (thesis) which discussed fiamolite ridges & degree of welding of tuffaceous deposits in bishop region top unit - densely welded - see well devel polygonal cooling joints - and opening & slip as continue down section - do they follow these preexisting weaknesses of the cooling joints and increase fr. intensity

Field TODO: David Ferrill suggestion:

* Get known volume of units in strat section to verify changes in porosity & measure density of rock versus fracture intensity

RF 4/2/03
KCB 7/6/02

* Send Cindy 38.96 for X costs

* Cindy needs -

- ① maps 4 transects
- ② F.I. data for transects in excel file
ID - #/L
ZO - L/A
- ③ Sieve analysis
- ④ send claysmeas work
- ⑤ Digital photos + T/P of tape

* TO DO in field - grsz analysis around each air perm test site

XRD prep -

KCB 7/6/02

BT-75C-02 - crucifix

Footwall side of ft core

BT-76a-02 -

HW side of east wedge fault (crossing faults)

BT-76b-02

Core of E wedge or crossing fault

RF 4/2/03

KCB 7/7/02

XRD prep continued - crush & grind and place sample in 1 dram vials

BT-76a-02

HW side of east wedge (crossing) fault

BT-76b-02

Core of east wedge fault

BT-76c-02

Footwall side of east wedge fault

BT-77-02

BT-78a-02 - Hanging wall core

BT-78b-02 - Fault core

BT-78c-02 - FW core

BT-79-02

BT-80-02 - FW

RF 4/2/03

X

USU -

7/8/02 KCB

1. mailed may & june invoices thru US postal
2. mailed document of updated notebook format to Div. 20
3. Scan field maps @ USU on gateway EV700 in room 304 Scanner - HP scanjet 5470C save as Adobe PHOTOSHOP 6.0 .psd files on Zip Disk
 - a) cfmapa.psd - crucifix fault profile map from 0 - 365cm



[NOTE: Distances not corrected yet for T/P of tape]

- b) cfmapb.psd - crucifix ft map profile from 365-940cm
- c) cfmapc.psd - crucifix ft profile map from 940-1060cm



[NOTE: Distances for T/P of tape are not corrected yet]

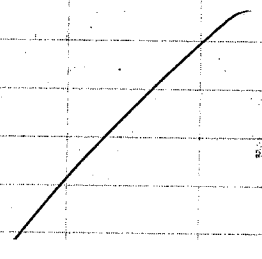
- d) cchwlh - chalk core fracture map of CCHWI from 3-6m
- e) cchwla - chalk core fracture map of CCHWI from 0-3m

RF 4/2/03

USU

KKB 7/8/02

- f) CCHW'c - chalk cave frac map from 5.0 - 5.5 m
- g) CCf1ta - chalk cave fault profile map on steep slope 8 - 17 m
- h) CCf1tb - chalk cave fault profile map from 0 - 8 m



USU

RF 4/2/03
KKB 7/9/02

*received email from C. Dinwiddie wrt to air perm data - attached included two updated files with the corrected crucifix/cross-fit transects

Epoxy samples - impregnate w/ epoxy and blue dye to preserve sample for thin section analysis

BT-55-01 Run #4 11a.m.

Cynthia L. Dinwiddie

From: kelly keighley bradbury [kellykb@cc.usu.edu]
 Sent: Wednesday, November 19, 2003 3:33 PM
 To: cdinwiddie@cnwra.swri.edu
 Subject: RE: more questions

bt 55 was a sample collected by jim and i in 2001. it was from chalk cave fault but some of the earlier samples were epoxyed before i had a chance to xrd them...so there is no xrd file for this sample. i refer to it because it is from the chalk cave fault surface and its files will be included when i send the microstructure folder. the photo you have is from the whole rock sample prior to it being cut...
 kkb

Recorded by Attached relevant email 06/04/04

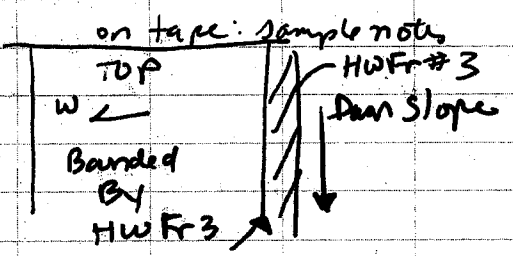
RF 4/2/03

USU - current

KKB 7/10/02

- take BT-55-01 out of oven
- prep BT-70-02
 Run #1 - 9:30am
 Run #2 - 12:45pm
 Run #3 - 4:15pm

- BT-87-02 - 14m



- BT-90-02
 Sample from crucifix fault transect @ 9.65m
 sample consist of fault gouge core unfortunately - sample damaged during transport

BT-91-02 orientation is hard to read - check field notes to re-orient

RF 4/2/03

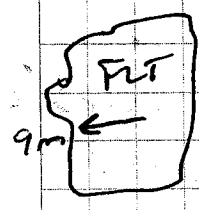
USU -

KKB 7/11/02

- Epoxy #
- Run BT-70 #4 @ 1:30pm
- prep for XRD analysis
 BT-75b-02 - fault core
 BT-81-02 - FW gauge
 BT-88-02
 BT-89-02 - clay gouge from fault core

Epoxy
 BT-70 is still showing signs of weakening @ 4:30pm
 do Run #5 @ 4:30pm - let run overnight.

XRD (cont.)
 BT-82-02
 2cm thick fault core @ 9m station along Chalk cave fault zone transect



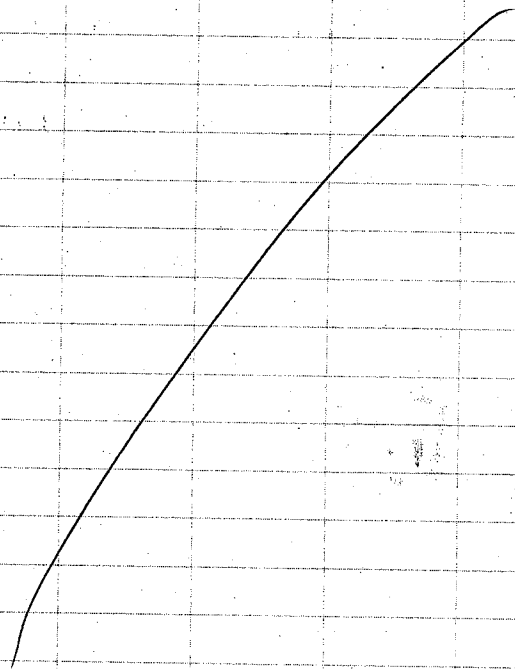
Recorded by

RF 4/2/03

USU

KCB
7/8/02

- f) CCHW1c - chalk cave frac map
from 5.0 - 5.5 m
- g) CCf1ta - chalk cave fault
profile map on steep
slope 8 - 17 m
- h) CCf1tb - chalk cave fault
profile map from 0 - 8 m



USU

RF 4/2/03

KCB
7/7/02

*received email from C. D. Widdie
wrt to air perm data -
attached included two
updated files with the corrected
crucifix/cross fit transects

Epoxy samples - impregnate w/
epoxy and blue dye
to preserve sample for
thin section analysis

BT-55-01 Run #4 11 a.m.
Run #5 2:45 p.m.

ADD more epoxy over top of sample
3pm - place sample in oven -
will need to run for at
least 8 hours

Recorded by

Attached relevant email 06/04/02

RF 4/2/03
WML

KCB
7/12/02

Begin Sieve Analysis

- * prep lab space to conduct work
- * borrow 1mm & 4mm sieves from Davis or in USU soils
- * clean sieves
- * place samples for sieve analysis

Chalk Core Samples -

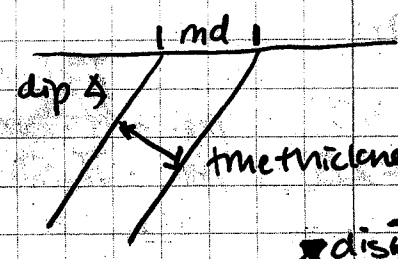
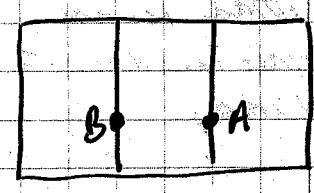
- BT-71-02 - Fault zone Core
 - BT-73-02 - Fault gas core associated w/ hanging wall
 - BT-74-02 - Fault gas core associated w/ footwall
 - BT-78 a - HW core
b - core
c - FW core
 - BT-79 - HW
 - BT-80 - FW
- Crucifix/Crossing Faults site:
- BT-75a-02 - crucifix HW fit core
b-02 - FLT core
c-02 - FW fit core
 - BT-76a-02 - wedge fault & strand HW core
b-02 - core
c-02 - FW core
 - BT-77 - core of w wedge of fit strand

Bishop
Well - CNUWA

RF 4/2/03
KCB 7/16/02

→ Calculations for transect maps to get true distances of geologic map info. Transects T/plunge of tape were measured in CCHW1-0-3m field and ϕ 's are used for dip.

* use true thickness calculation - assume transect is \perp to strike and beddace \oplus



$t = md \cos(\text{dip})$

* use cosine ϕ instead of sine ϕ - looking for true thickness not true bed

md is map dist. in dip dir.

- 0-1m = $\alpha = 47^\circ$ - md = 1m
- 1-1.5m = $\alpha = 36^\circ$ - md = 0.5m
- 1.5-2m = $\alpha = 35^\circ$ - md = 0.5m
- 2-2.5m = $\alpha = 37^\circ$ - md = 0.5m
- 2.5-3m = $\alpha = 27^\circ$ - md = 0.5m

RF 4/2/03

KCB 7/16/02

CCHW1-0-3m

$t = md \cos \alpha$

0-1m = $t = 1 \cos 47^\circ = 0.68$

1-1.5m = $t = 0.5 \cos 36^\circ = 0.29$

1.5-2 = $t = 0.5 \cos 35^\circ = 0.28$

2-2.5 = $t = 0.5 \cos 37^\circ = 0.29$

2.5-3 = $t = 0.5 \cos 27^\circ = 0.23$

Total transect 2.32m

True thickness = 1.83m

* see CCHW1 map - field sketch

CCHW1-3-6m

150m

300-450cm = $\alpha = 35^\circ$ md = 1.5m

450-600cm = $\alpha = 28^\circ$ md = 1.5m

$t = md \cos \alpha$

300-450cm $\rightarrow t = 1.5 \cos 35^\circ = 0.86$

450-600cm $\rightarrow t = 1.5 \cos 28^\circ = 0.70$

total dist = 1.32m

= true thickness = 2.55m

WML

RF 4/2/03
KCB 7/16/02

Transect CC2 - true thickness calculation

approx $\alpha = \alpha$

0-215cm = $\alpha = \text{plunge} = 17^\circ \rightarrow t = 2.15$

215-365cm = $\alpha = 8^\circ$ at = 1.50m

365-550cm = $\alpha = 40^\circ$ at = 1.85m

$t = md \cos \alpha$

2.05m

$t = 0-215 \text{ cm} \rightarrow 2.15 \cos 17^\circ = 0.63$

$t = 215-365 \text{ cm} \rightarrow 1.50 \cos 8^\circ = 0.21$

$t = 365-550 \text{ cm} \rightarrow 1.85 \cos 40^\circ = 1.19$

total transect = 4.96

Distance corrected = 2.03m

Crucifix/CrossFit - transect distance

0-75cm = 002° plunge $\rightarrow 0.75$

75-150cm = 09° plunge $\rightarrow 0.75$

150-365cm = 09° plunge $\rightarrow 2.15$

365-1063cm = 10° plunge $\rightarrow 6.98$

0-75cm = at $\rightarrow t = 0.02 \cos 75^\circ =$

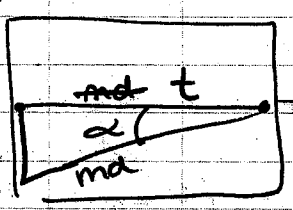
Project No. _____
Book No. _____
TITLE _____

Project No. _____
Book No. _____
TITLE _____

Project No. _____
Book No. _____
TITLE _____

PF 4/2/03
WM
Crucifix transect
KKB 7/16/02

RWF for
KKB 10/17/02



outcrop is vertical
transect @ same
plunge from horiz
md = map distance
along tape measure
t = true thickness
or horiz distance
along transect

$$\cos \alpha = \frac{t}{md}$$

$$md \cos \alpha = t$$

RWF for
KKB 10/17/02

0-75cm - $\alpha = 002^\circ$ $t = (0.75) \cos 002^\circ = 0.75$
 75-150cm $\alpha = 003^\circ$ $t = (0.75) \cos 003^\circ = 0.75$
 150-365cm $\alpha = 09^\circ$ $t = (2.15) \cos 09^\circ = 2.12m$
 365-1063cm $\alpha = 10^\circ$ $t = (6.98) \cos 10^\circ = 6.87m$

total distance
corrected for
tape slope $\alpha = \underline{10.49m}$

PF 4/2/03
WM
KKB 7/16/02

XRD prep -
BT-9202
BT-9302
BT-8302 - 10.4-10.5m ^{large} _{infall}

Weigh samples for sieve analysis
include following -

- BT-71-02
- " 73 "
- 74
- 75a
- 75b
- 75c
- 76a
- 76b
- 76c
- 78a
- 78b
- 78c
- 77
- 79
- 80

Refer to pages
82 and 83
for weights
and results
1) measure total wt
2) divide using
sieve sizes:
4mm
2mm
1mm
0.5mm
0.125mm
3) measure weight
within each grain
4) Bas & parately

PF 4/2/03
WM
KKB 7/16/02

SAMPLE #	TOTAL WT (g)	Sieve sizes KKB 7/16/02 ≥ 4mm
BT-71-02	3.7g	0.5
BT-73-02	84.2g	12.2
BT-74-02	53.0g	8.1
BT-75a-02	89.8g	9.4
BT-75b-02	165.8g	7.5
BT-75c-02	140.7g	15.8
BT-76a-02	74.0	7.4
BT-76b-02	188.7	4.9
BT-76c-02	25.6	0.3
BT-77-02	42.8g	0.0g
BT-78a-02	208.6	20.5
BT-78b-02	23.1	4.7
BT-78c-02	285.4	34.1
BT-79-02	262.42.8	48.0
BT-80-02	242.192.7	26.9
(↑ still do - had to re-transect)	(↑ scale - sum - 86)	TOTAL WT BASED ON PIN MEASURES
Complete on 8/6/02	by size	≥ 4mm

PF 4/2/03
WM
KKB 7/17/02

≥ 2mm	≥ 1mm	≥ 0.5mm	≥ 0.25mm	≥ 0.125mm
0.6	0.1	0.1	0.1	0.1
5.2	6.9	9.6	19.5	27.1
4.4	5.3	6.7	11.2	13.4
8.5	10.5	13.8	32.3	11.5
17.0	25.4	25.0	57	30.0
12.6	15.5	17.0	52.4	23.2
3.1	4.9	9.2	34.3	11.4
3.9	15.8	28.7	110.2	22.6
1.2	2.0	4.2	12.9	3.5
0.4g	0.3g	1.2g	12.7g	25.7g
8.8	15.9	22	61.3	72.5
1.1	1.3	2.0	5.7	6.2
15.5	25.6	38.0	98.4	69.5
15.2	27.5	33.1	79.8	58.5
24.8	25.1	15.5	20.9	16.0
2-4mm	1-2mm	0.5-1mm	0.125-0.5mm	0.125mm

RF 4/2/03

USU

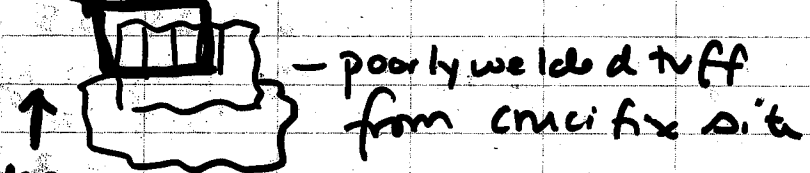
KWB 7/18/02

see note on p. 86

Sample BT-70 was broken in chamber - re-epoxy portion of remaining sample. Reign vacuum run #1, BT-70

epoxy vertical set of fractures

sample area



(up is outtemp up / sample up)



RF 4/2/03

USU

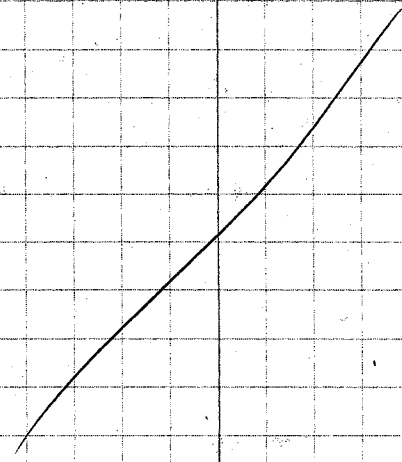
KWB 85

7/19/02

BT-70 epoxy and run #2 in vacuum chamber 4 hrs

BT-70 " " run #3 6 hrs

BT-70 " " run #4 6 hrs



RF 4/2/03

USU - rock maplas

KWB 7/22/02

epoxy & trim sect prep.

BT-70 - run #5 4 hrs

BT-70 Run #6 3 hrs

in future - good idea to take photos of samples prepared in lab w/ orientation etc included in photo attach to notebook especially if sample breaks or is disturbed by others in lab!

RF 4/2/03

USU

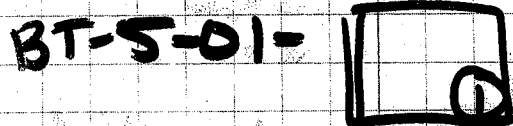
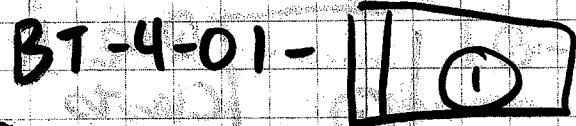
KWB 87

7/22/02

Settings - 8.5V light intensity 100 speed film @ 11" w/ 4x magnification BH-2 OLYMPUS PHOTOMICROGRAPH microscope

BT-1-01 - center slide BHS P model

BT-3-01 - ctr of slide



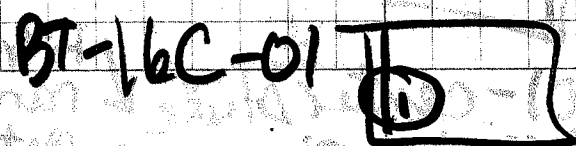
BT-6-01 - center slide

BT-9-01 - center slide

BT-10-01 - center slide

BT-16A-01 - center slide

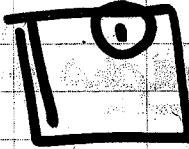
BT-16B-01 - center slide

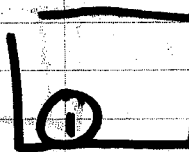


for use in manual for 2002

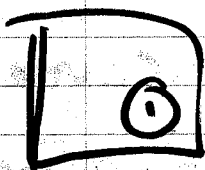
RF 4/2/03
WUW

KKB
7/22/02

BT-31-01  - Fracture
creates pore
space?

BT-32-01  Qtz - Fr.
Clasts

BT-52-01 Center Slide

BT-52-01 

BT-53-01 fr w/ Blue dye



BT-54-01 - center slide ← Film
possibly nopic. ← out

RF 4/2/03

KKB
7/23/02

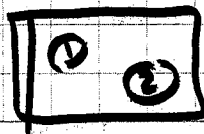
WUW

BT-70 - run #8 - 4hrs

BT-70 - run #9 - 4hrs

* sample is taking much
epoxy due to
fractured nature.
fractures are open
w/ no fill ~
w/in gray - sandy
pumice horizon that
forms distinct
thin going small T_L
fractures - see
photomosaic maps
for bed location

Photomicrographs -
BT-54-01



RF 4/2/03

WUW - rock prep

KKB
7/24/02

BT-70 run #10
(LAST RUN)
6 HRS

WRT
PHOTOMICROGRAPHS

From DAVIS, George H.

Structural Geology of
Rocks & Regions, 1984
JOHN WILEY & SONS

Compaction strain in ASH-FLOW TUFFS

Welded textures of primary origin -

char. of ash-flow tuffs

welding reflects the compaction
strain of a hot, heavy, chemical body

Incipient welding -

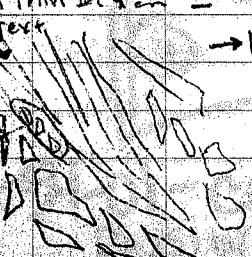
sticking together of glassy
volcanic fragments at their
points of contact

in Thin Section

Flow texture

→ Least welded

gas
bubble
vesicle



RF 4/2/03

KKB
7/25/02

WUW - sample prep

incipient welding (cont.)

more welded →



pumice
clast

- tightly
compacted
- very little
open/black
space

Complete welding - elimination of all
pore spaces (including
vesicles) and the
distortional flattening of
glass shards & pumice frag.
the result is termed

Eutaxitic Structure -
a foliation defined by
aligned flattened shards
& pumice fragments
at the base of some ash flow
sheets the flattened pumice
is ellipsoidal in plane of
foliation - such elongation
reflects kinematics in form
of late - stage material
flow as a whole → in steep
partings/fractures follow concentrations
of pumice lapilli which get weathered out

RF 4/2/03

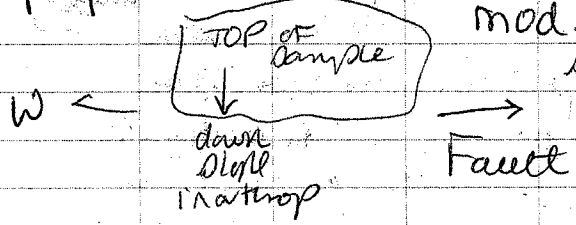
KCB 7/24/02

usu - sample prep
transsect map prep

- BT-70-02 → in oven!
Bake 8 hours
- prep samples for Xrd @ USU -
Method: Crush piece of rock w/
mortar & pestle & place
in 1 dram bottle
for each sample described
hereafter - each sample will
be run for X-Ray diffraction
analysis w/ USU equipment
to determine mineralogy
of whole rock; Frac; or faultite

prep - BT-84-02 - fault gouge

prep - BT-85-02 - iron-oxide?
mod. pink orange stain



BT-86-02 - sample from
13.7m along
fault transect
@ chalk Cove

KCB RF 4/2/03

usu - sample prep
transsect map prep

BT-63-02 - epoxy w/ blue dye
added
Run #1 - 9am

BT-63-02 - epoxy again
Run #2 - 1pm

Thin sections - need to copy notes
from James P. Evans
for information wrt
his thin section review of
samples while he was
still under contract w/ CNWRA

BT-1-01 - incipient welding
least welded; w/ open fractures
crosscutting rocks
well developed xls
flaw & textured
some gas vesicles
xls have pts of contact
indicating welding
vs. non.

RF 4/2/03

KCB 8/1/02

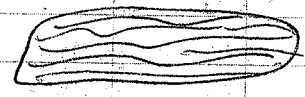
* Run #3 on BT-63-02

usu
Thin sections - (cont.)

BT-3-01 - abundant black/
dark space -
probably more welded
than previous sample
incipient welding
incipient

complete?
RF for KCB 10/1/02

however there is a fabric
in going w/in xls
in slide



BT-4-01 - grainy fabric
w/ vesicles
fracture fill? = mix of
silica rich fluid and
calcite

BT-5-01 - open fractures w/in
Quartz rich incipiently
welded matrix x-lization
parallels outer edges of open
frac. - Qtz xls + Calc

RF 4/2/03

KCB 8/5/02

9:30am - teleconference w/ Cynthia
Dinwiddie - CNWRA

- ① - Field Trip proposed dates
~ September 13th
(Pick field assistant)
Heermance
meet Cyrdy on Sept 16th
- 20th

- ~ Field Data to collect -
- ② Grain Size Analysis
around perm-test sites
- ③ Detailed Strat.
column - sample
in detail
- ④ get host rock
grain size samples
at crucifix site
- ⑤ borrow pit?

② Discuss procedures
for Abu abstract

10:50am - talk w/ David Ferill
wrt Abu abstract

RF 4/2/03
Home

KKB
8/6/02

Write and submit Abstract for AGU Fall/Annual meeting - submit to Cynthia who will pass on to Technical review

Abstract title - Saved in MS Word
Fault zone characteristics and Deformation Mechanisms of the BISHOP TUFF, BISHOP, CA: Investigation of Critical Deformation elements and permeability w/in a pervas, non-welded Tuff Sequence

Abstract for submittal to AGU fall meeting Tectonophysics Session T04: 'Ruins & Faulting, Cause & Effects'

Co-authors - David Ferrill, Randall Feders, & Cynthia Dinwiddie

Recorded by

RF 4/2/03

KKB
8/6/02

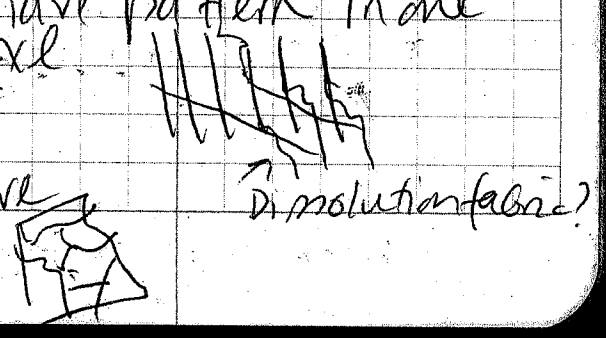
usu

- Grain size analysis on sample BT-80-02 - See page 82 - 83 Conducted in Soil Lab @ Utah State University borrowed sieves from Dan OR / SOILS Lab

Thin Section Analysis (cont.)

BT-6-01 - incipient welding open fracture space &/or openness w/in matrix as a result of poor welding is partially filled w/ CaCO₃ Quartz xls are intensely fractured - fractures have pattern in one xl

in other frame mark Random



Project No. _____
Book No. _____
TITLE _____

RF 4/2/03

KKB
8/7/02

Refine abstract for AGU based on email edits from Randall Feders & Cynthia Dinwiddie

- Copy paper for reading - Jorde et al, 2002, AAPG Bulletin v86 #7

Thin Section Analysis (cont.)

BT-9-01 - incipient to more welded fracture Xcuts matrix of elongated pumice clasts w/ flow fabric - fracture is stained w/ red-brown FeOx material grading to quartz - each of these mineral fillings // to ea other & fr surf. & also // to fabric of compaction

Recorded by

RF 4/2/03

KKB
8/7/02

Telephone Discussion w/ David Ferrill - edit abstract for AGU - Key issue @ Yucca Mtn where proposed repository horizon new & volcanic tuff has non-welded sequence above the storage may have impact 8/17/02

Describe fitz deform. processes in non-welded tuffs; relate to amount of displacement; qualitative summary about faults in non-welded tuffs - currently these are poorly understood fitz Faultz Deform Mechanisms: 1) grain comminution 2) extensional fr. 3) smearing 4) pure fracturing

Rescan of map - transect map C-f - Open in a.i. Continue illustrating & calculating fracture intensity data around each gas perm station

prep for xrd - Run Samples BT-71-02 - Fault core chalk case BT-72a-02 - upper flt core BT-72b-02 - " " BT-73-02 - flt core or ft

Project No. _____
Book No. _____
TITLE _____

100 RF 4/2/03

KICB
8/12/02

→ illustration of CCHW1a.psd -
 finish Draft version
 save as CCHW1a.psd w/scan
 also CCHW1a (w/o scan)
 [CCHW1a.bmp
 CCHW1a.pdf
 email these versions
 to Cindy & Randy
 on 8/12/02

12:30pm-

- emailed Randy Guelph sample data and copy of CCHW1a maps for CCHW1 fault site
- email Cindy map CCHW1a in addie illustrator and pdf file

Conversations w/ David Tenill
 Small scale reality ≈ Lg scale generalization
 What influences this?
 Fanning fr pattern ~ distributed damage
 faults initiate as shear w/ very thin zones of damage
 - FLINT (paper) → lateral diversion occurs as H₂O hits nonwelded tuff from above

Recorded by

RF 4/2/03
KICB
8/13/02

→ illustration of CCHW1b.psd
 finish draft version
 save as CCHW1b.psd -
 this includes original scanned map
 → also save as CCHW1b with only illustration not including scanned file
 also save as pdf & eps for Randy & Cindy

• prep BT-74-02 for xrd
 BT-75-02 8/14/02

→ email Randy Fedora & Cynthia draw addie draft copies of CCHW1b map plus CC2 Guelph perm test sample data

102 RF 4/2/03

USU

KICB
8/15/02

Sample prep - RUN XRD
 BT-75c-02 - Fw side of fault
 BT-76a-02 - cross in tuff - east wedge of H
 BT-76b-02 - cross in tuff - west wedge of H
 BT-76c-02 - cross in tuff - central core
 BT-77-02 - cross in tuff - W. wedge of H
 BT-78a-02 - chalk core
 HW core
 BT-75b-02 - CF HW side core

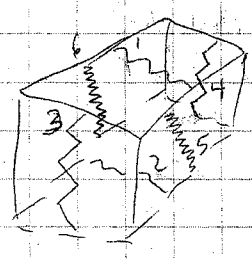
KICB
8/15/02

RF 4/2/03

KICB 8/15/02

email from Randy - 8/14/02

Guelph sampling
 - do more for field trip planned in Sept. / also collect more @ CC site
 - for accurate measurements on bulk volume
 can cut rectangle in rock and measure volume with 6 measurements - 2 w/in ea dimension



Recorded by

104 RF 4/2/03

VUB 8/16/02

Prep XRD - 179 & 80
Thin Sections (cont.)

BT 10-01 - incipient welding
more welded
flattened/elongated
pumice clasts
tightly compacted
flow fabric in matrix
halos of silica-rich
fluid surround
pumice clast

BT-10A-01 - sample is
flattened core // to
om. fault @ basement
fragmented pumice
clasts w/ abundant
vesicles surrounded
by fill parallel
to fault fill
silica rich and
less CaCO₃ fill
minor Fe₂O₃
fill is grainy not discrete
dissolution texture

RF 4/2/03

VUB 105 8/19/02

Thin Section (cont.)

BT 10B - abundant blue dye
fills originally open
fracture - fractured
quartz xls ~ dissolution
of quartz see
deposit of CaCO₃ xls

BT 31 - extremely fractured
Quartz - brecciated
throughgoing fractures
also note serrated
edges - textures
indicative of
dissolution / reprecip
of quartz

prep Xrd - BT 81-02
BT-82-02

108 RF 4/2/03
USU -

VUB 8/20/02

Begin Run of XRD -
~~prep~~ Xrd - BT-83-02
KUB 8/20/02 - BT-84-02

a portion each sample is taken and
placed on a stainless steel
plate - sample must be
tamped & flattened
use USU XRD equipment
run sample from 0-60°
@ 4° 2θ - each sample
runs for 30 minutes
save pdf (mineralogical
signature file) under
Kelly folder on PC
in room 115 - analyze
pdfs after all samples
complete

RESULT
OF
XRD
SCAN

redo
Xrd run - BT 75a
75b
75c

XRD machine
was broken on 8/15/02 - has since
been repaired but don't trust previous results

RF 4/2/03

VUB 107 8/21/02

USU

* need to write & submit Statement
of work for Dick Heermance
who will be assisting
in field in September
send to English Pearson,
CURA

Thin Sections (cont.)

BT-32 - beautiful well-
developed quartz xl
- vesicles w/in xl
fractures w/in
xl = 20
some are filled w/ blue
dye indicating
fractures extend
thru matrix

BT 50c - carbonate fill
poorly w/in fractures
welded &/or matrix & surround
glassy xls
mafic clasts quartz xls w/ seaweed
textures - abundant
vesicles

Recorded by

108 RF 4/2/03
usm

KUB
8/21/02

Thin sections -

BT-52-02 - very poorly welded
mafic clasts
abundant dark
- open pore space
fill w/ amorphous quartz
= glass

BT-53-02 -

Heart shaped quartz
Xl is fractured and
along two fractures
Xl is dissolved
blue dye fills open
fracture
opaque / glassy
matrix

BT-54-02 - elongated prismatic
clast surrounded
incipient
welding
potentially
same caliche
factures filled w/ silica

SN 515 \ Photos Page 58 \ photos 7-01 \ borrow.pit \ filename CLD, 11/14/03

4/2/03
RF

KUB 108
8/22/02

Sample map -
Runout of
epoxy - re-order 8/22
from palhauve petro.

~~BT-51-02~~ KUB 8/22/02
re-name
Borrow pit (additional digital
photos from 7/01)

- 0827 - bpit wall men
 - 0829 - bpit wall men 2
 - 0831 - bpit wall men 3
 - 0832 - bpit wall men 4
 - 0833 - bpit wall men 5
 - 0835 - pavement Afr
 - 0836 - ∅
 - 0839 - pave Afr 2
 - 0840 - bpit wall fr
 - 0841 - bpit wall fr fill
 - 0842 - bpit wall fr 2
 - 0843 - bpit wall fr 3
 - 0845 - bpit wall fr close
 - 0847 - bpit wall con jfr
 - 0848 - bpit wall con jfr 2
 - 0849 - bpit wall con jfr 3
- } might be pit
pit wall
dashed check

110 4/2/03
RF

KUB
8/22/02

map CC2 - chalk cave transect 2
merge CC2a + CC2b into one file
in adobe illustrator called CC2
illustrate map from this file

* See Cynthia Dinwiddies, ~~owner~~
most current notebook
for hard copy of
completed map

9/3/02 KUB

- also refer to page 117 → page 62
of this notebook
this SN.

CLD
11/14/03

Photo A = locations of crucifix fault rock
samples for whole rock analysis.

Photo B = Upper crucifix outcrop
outcrop with location of rock

sample in green ash sequence;
Jim Evans for scale.

Photo C = view looking north
of crucifix fault zone,
lower outcrop.

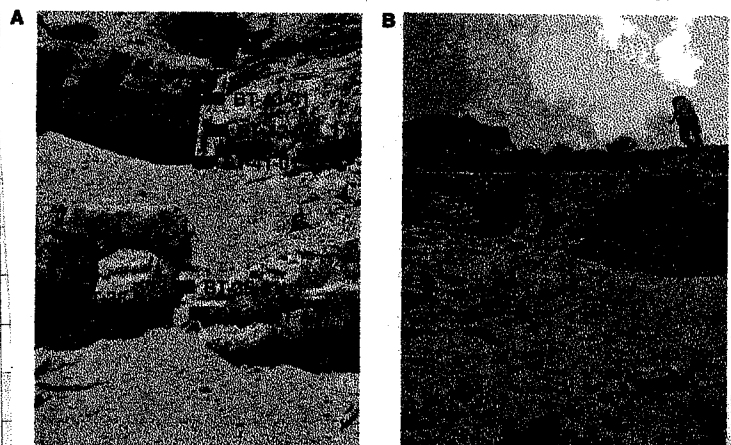
(CLD, 11/19/03)

RF
4/2/03

KUB 111
8/26/02

usm

- Sample custody forms
- print file - SAMCUSTO.FRM
from sandy fedors; photocopy
[to date possess 98 samples
from bishop tuff site]



58 Project No. _____ Book No. _____ TITLE _____

59 Project No. _____ Book No. _____ TITLE _____

4/2/03

KCB
8/27/02

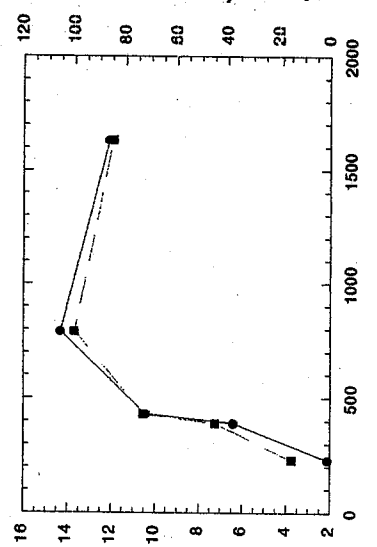
- Sample custody - continue
- previous page
- photo of crucifix fault w/
same sample locations

Crucifix fault site
XRD results from
first batch of samples analyzed

Sample	Structural Position	Quartz	Potassium Feldspar	Plagioclase Feldspar	Calcite	Glass
BT-34-01	Footwall					
BT-35-01	Footwall					
BT-36-01	Footwall					
BT-37-01	Footwall					
BT-38A-01	Fault-shear					
BT-38B-01	Fault-shear					
BT-39-01	Footwall					
BT-40-01	Footwall					
BT-41-01	Fault-shear					
BT-42-01	Footwall					
BT-43A-01	Fault-surface					
BT-43B-01	Fault					
BT-44-01	Footwall					
BT-45-01	Fault-surface					
BT-46-01	Footwall					
BT-47-01	Hanging wall					
BT-48-01	Hanging wall					
BT-49-01	Fault					
BT-50A-01	Footwall fault					
BT-50B-01	Footwall fault					
BT-50C-01	Footwall fault					
BT-51A-01	Footwall vein					
BT-51B-01	Footwall fault					
BT-51C-01	Footwall fault					
BT-51D-01	Footwall fault					

Distance From Source Bed (cm)	CSF	SF	SF	SCR
20	11.25	0.75	46.666667	2.14285714
61	83.1987213	0.73770492	15.5555556	6.43857143
185	35.4740741	0.54074074	9.3890411	10.42857143
110	90.5050509	0.90909091	0.85	8.23529412
100	72.25	0.85	8.23529412	12.1428571
247.079886	3.78759657			

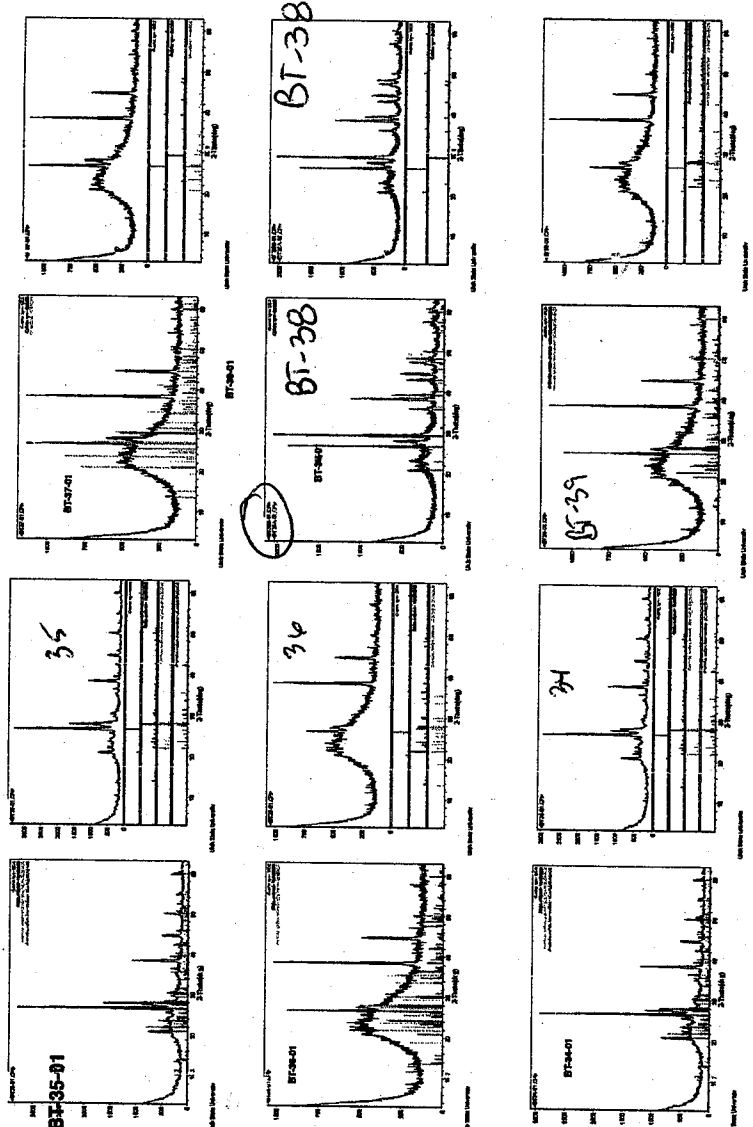
4/2/03 KCB
8/28/02



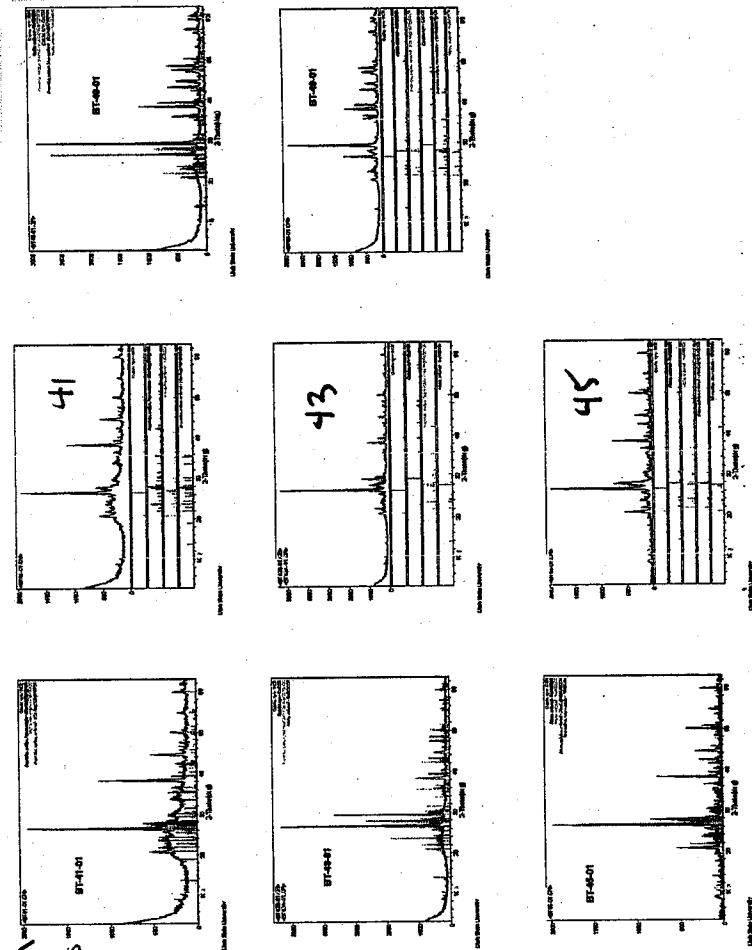
Yielding, 1996
SBR
Calculations/
Clay smear
analysis
of crucifix
fault
samples

SBR vs BDDTHICK
BDD
SBR
Plot - shows
SBR correlates
w/ Bed
thickness
@ crucifix
site & for
first
1/3 m of fault samples

4/2/03
1/4 Xrd -
Clay smear samples
KCB
8/29/02



Xrd - Clay smear
analysis
KCB
8/29/02



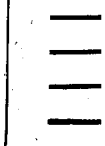
Files found:

SN515\XRDanalysis\
BT34(5)\Flanames
where filenames
include:
BT34-01.bmp
BT34-01.cpi
BT34-01.hit
BT34-01.scw
BT34-01.tif
BT34x-01.tif
and the like.

CLD, 11/14/03

Recorded by

Recorded by



116 RF 4/2/03

KKB 9/3/02

illustration of map CC2 -

- faults are 1pt linewidth
- major fr = 0.5pt "
- minor fr = 0.25pt "
- ocean/transect lines = 1.5pt

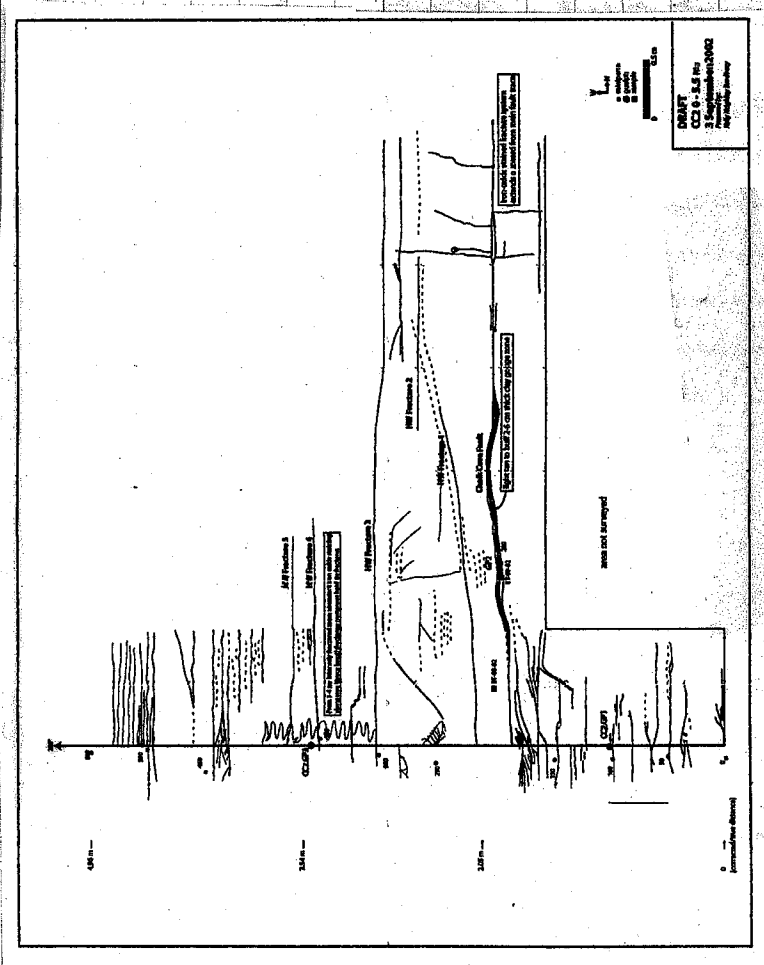
→ image is larger than standard 8 1/2 x 11 paper reduce to 60% and save as CC2 60%

→ keep both original and this version original is file CC2 in adobe illustrator 9.0

Recorded by

4/2/03 RF KKB 9/3/02

CC2
MapCC2-reduced



Readable map located on CD @
SN 515 \ Chalk Cove Map Page 62 \ cc2_cc3.ppt
(LCD, 11/14/03)

118 RF 4/2/03
usa

KKB 9/4/02

- prep samples for xrd and thin section

BT-91-02 - crush for xrd
 BT-92-02 - crush for xrd
 BT-93-02 - crush for xrd
 place above in 1 dram bottles to run xrd analysis

take remaining undisturbed sample downstairs to rock lab and clear surfaces - mix epoxy and blue dye -

begin run #1 for
~~BT-91-02~~ → KKB 9/4/02
 NOT enough for thin section

- BT-92-02 ?
- BT-93-02 ?

Recorded by

RF 4/2/03 KKB 9/5/02

- prep samples for xrd and epoxy for thin sections

sample suite from stratigraphic column site just west of Crucifix site - see page 65

- Unit A BT-94-02 → ✓ ready for xrd
- Unit B BT-95-02 → ✓ " "
- Unit B/C BT-96-02 → ✓ " "
- Unit C_a BT-97-02 → ✓ " "
- Unit C_b BT-98-02 → ✓ " "

* take piece of each and crush each and place in 1 dram bottles for mil composition remaining sample to go downstairs to rock lab for thin section prep

120 RF 4/2/03
uru

KCB
9/6/02

- Begin to run samples on page 119 through xrd machine - run @ 20; 0-60°
- Also - begin epoxy of remaining portion of these samples for thin section prep.

page 63 this SN

CLD
11/17/03

RF
4/2/03

KCB
9/19/02

Smithfield office

- organize print photos of crucifix site into photo mosaics and tape to use for reference in mapping / illustrating maps and sample locations @ this site possibly scan these later after compare w/ digital photos - also tape and line up photos from David Ferrell & Alan Morris @ crucifix site - large prints
- There are excellent quality images & probably most useful for fracture intensity data comparisons using photos vs. field data

122 RF
4/2/03

KCB
9/10/02

- Clean and organize field box; re stock from USU supplies -
- Cloth bags
 - baggies - whirl paks
 - sharpies etc
 - computer printer + paper
 - digital camera charged

KCB
9/11/02

RF
4/2/03

Epoxy samples and run in vacuum #2 run

- BT-95-02
- BT-96-02
- BT-97-02
- BT-94-02

Continue w/ xrd analysis →

- BT-96-02
- BT-97-02
- BT-98-02

RF 4/2/03

office

KLB
9/12/02

organize digital photographs

7/01 → borrow pit - change image sizes to 4.5 x 6

rename photos.

✓ 0850 - bpit dyet test begin pit 1 or 2?

x 0853 - bpit calcite frac ~ near pit 3

✓ 0854 - bpit CaCO₃ fr 2 ~ near pit 3✓ 0855 - bpit CaCO₃ fr 3 ~ near pit 3✓ 0857 - bpit CaCO₃ fr 4 pit 3 ~ near pit 3✓ 0858 - bpit CaCO₃ fr 5 pit 3

✓ 0859 - bpit pavement Bar C { B? }

✓ 0860 - bpit pavement B?

✓ 0861 - image KLB bpit pavement close 9/12/02

0862 - delete - par quartz

✓ 0863 - view w/1 - w/ jim + test site (42)

✓ 0864 - bpit pavement close 2

✓ 0865 - bpit pavement close → CaCO₃ fr fill

0866 - delete - par quartz

✓ 0867 - bpit pavement close fr 2

✓ 0870 - craig jim - PhD sampling strategies

✓ 0871 - PhD sampling KLB 9/12/02

✓ 0872 - PhD w/ foam

All photos here available on CD @:

SN 515 \Photos Page 66 \photos 7 - 01 \borrow pit \filename (CLD, 11/14/03)

RF 4/2/03

Office

KLB 128
9/12/02

7/01 photos continued for the borrow pit site

✓ 0875 - bpit - randy infil test

✓ 0877 - bpit infil test randy etc

✓ 0881 - bpit infil test 3 @ pit 3

✓ 0884 - bpit wall calcite fr → sample site or dyet test site?

✓ 0889 - bpit wall pit tests

✓ 0890 - bpit wall pit tests 2

✓ 0891 - bpit wall pit tests 3

PHOTOS FROM -

- 7/01 - 2/02

- 5/02

- 6/02

- 9/02

put into 1 folder - as bishop digital pics

RF 4/2/03

BISHOP, CA

KLB
9/13/02

11 am MDT - Rush Valley, UT

Leave for Bishop, CA - driving

personal vehicle

I-80 - AZT 93 - 6 → Bishop

Arrive in Bishop, CA -

9 p.m. Pacific Time

Staying @ Best Western Creekside

- no reservations w/ ?

share room w/ Dick Heermans

- Discuss field work

planned for

Saturday & Sunday -

Attack Stratigraphic

Column west of emicific

- tape & compass map

- photographs

- fracture intensity

data

RF 4/2/03

BISHOP, CA

KLB 127
9/14/02

- Sunny, windy day; working in field w/ Dick Heermans (formerly of USM)

Stratigraphic Column Site for Bishop Pit

- Complete vertical profile of strat column

- Dick went up slope w/ tape measure

to top of outcrop.

to do: characterize and describe

different lithologies as they

intersect tape

characterize fractures and

measure orientations & densities

sample as lithologies changes

Base of outcrop @ 0m - Unit A

strat. description

Colors - from Rock Color Chart - USGS

Unit A - grayish orange pink (10R 8/2)

poorly welded buff w/ abundant

moderate reddish orange pink

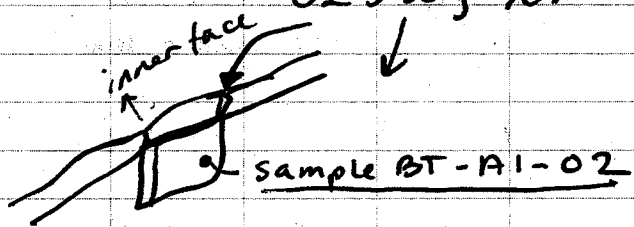
pumice clasts - fracture surfaces

stained mod. red orange pink (10R 6/e)

128 RF 4/2/03
Bishop

KKB
9/14/02

From 0-1.0 m = 10 fractures
along tape - undulating
- fr traces run
roughly parallel
to each other
~ S12W 87W
- fr surf 6 m south
of tape = S5E; 68W
@ 0 m - fr surface appears
similar to discrete
flt surfaces observed
@ Chalk cave site
S25W; 70NW fracture



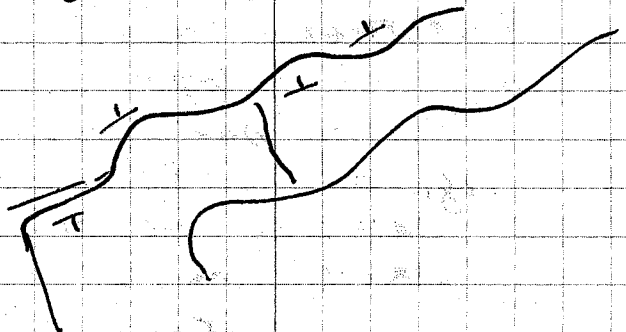
From 4.0-6.0 - 10 fr / 2m (5 fr / m)
system runs parallel to
S/W system described above

F₁ = frac system

RF 4/2/03
KKB 128
9/14/02

Bishop

6 m - orientation = N25E/57SE
F₁ part of set described @
0 m - note - this
system is highly
curvilinear



dip varies from east
to west dipping

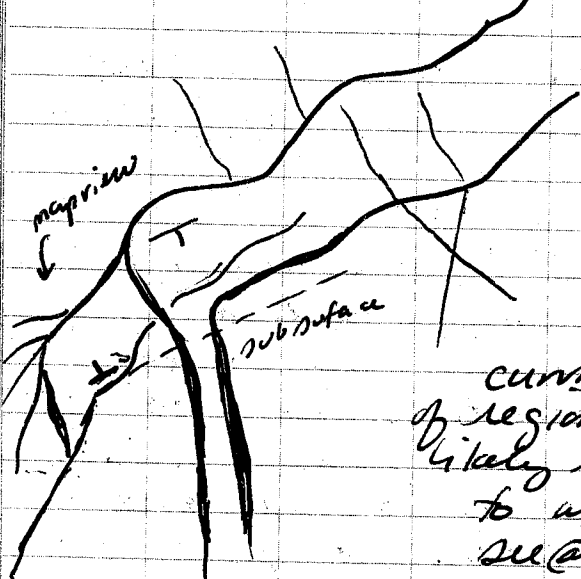
6.0-9.0 m = 7 frac - major set
F₁ frac horsetail @ tips
connecting this major
fracture system to
minor system running
oblique to tape and
also to major fr. system

138 RF 4/2/03

KKB
9/14/02

9.0 m - frac system 3 cm thick
marked by 8 cm of
moderate red orange pink
discoloration

major fracture system
fractures described previously
run \perp to tape and
roughly parallel to
regional flt/fracture
pattern noted @
Chalk cave site



curvilinear traces
of regional system
likely similar
to what we
see @ this scale

RF 4/2/03

KKB 138
9/14/02

9.0-11.0 m = 3 major frac
marked by moderate
F₁ orange pink discolor.

9.0-14.0 m - 6 major fracs \perp
F₁ to tape line - same
major frac system

13.75-14.1 m - 2.0-5 mm fr aperture
14:1 - 1-5 cm thick zone
of mod. orange pink
F₁ color

part of same fr system
oriented $\approx \perp$ to tape line

14.0-23.0 m - 5 major fracs
@ 23.0 m - 2 mm - 1.0 cm
thick due N-S (0.50W)

* set of hairline frac \perp
F₂ to major frac system
and oblique to tape line
frac system trace lengths of this
system are ~ 1-2 m
visible



122 PF 4/2/03
Bishop

KCB
9/14/02

23.0-26.0m - 2 major fractures F_1
(see below)

// to frac @ 23m
 F_2 - 15 hairline fracs

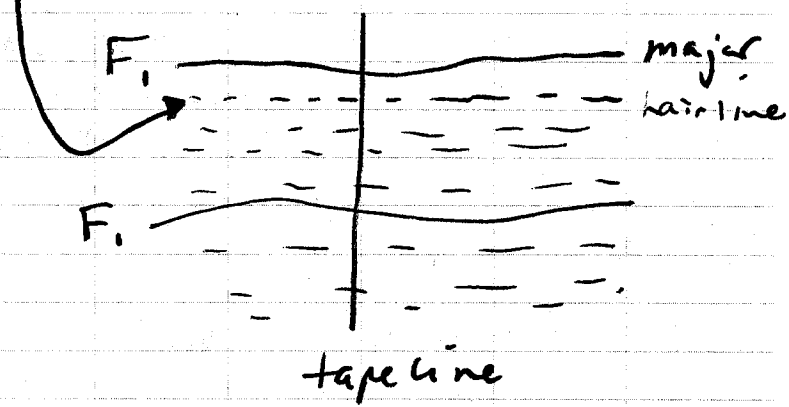
These are F_2 - F_1 OK yes 9/14/02

25.55 - major fracs ~ 3-8cm
knick zone char by
mod. orange pink

12 hairline (F_2) frac in
zone (F_1)

Hairline = ~1mm thick

1 frac \perp to main F_1 system
connects 2 main fracs
~57cm long



PF 4/2/03
KCB 128
9/14/02

Bishop

26.0m - begin to pick up
mod \perp / oblique
 F_2 fractures connecting
 F_1 fractures to each other

26.0-29.0m - 1 F_1 / major fr

29.0-33.0m = 8 F_1 / major fr

@ 31.5m = zone of hairline
fracs - 15 in 30cm
distance along tape

@ 33.0m = small fault
S13E / 81W
Sl. clef lines - 90 dip slip
(L rake)
1-10mm thick
trace

33.0-35.0m = 3 major F_1 fracs
2 F_2 fracs
connecting F_1 system

124 PF 4/2/03
Bishop

KCB
9/14/02

35.0-40.0m - 8 major fractures (F_1)
8 hairline fractures (F_2)

@ 40.0m - zone bounded by 2
major fractures 5-10cm thick
these two merge into a
2mm thick fracture surface
southwest of line - here
7 hairline fracs in zone

40.0-46.0m - 10 minor fracs 1-3mm thick
 \perp to tape
5 fracs of F_2 system

10/3/02
KCB

* NOTE - ALL observations have been
mostly from Sack side of transect tape

BT-A2-02 - \perp to layering, near transition
to B - low degree of welding

46.5-49.0m - block on N side of
tape - 43 minor fracs (1-3mm
thick)

49.0-51.0m - Rubble zone

51.0-53.0 - 4 fracs // to tape (F_2)

52.0 - contact of lighter pink (unit A)
mod. consolidated tuff below and
pink-red, poorly consolidated tuff (B)

PF 4/2/03
KCB 128

Bishop - Kelly & Dick Heermance 9/15/02
Continue Stratigraphic / frac
Description

52.0m - Unit B
poorly welded \Rightarrow non-welded
less welded than Unit A
- mod orange pink
10 R27/4 (darker than A)
- abundant pumice lapilli
(+ rocks, glass) clasts are
overall generally smaller
than Unit A (< 5cm size)

53.5m - Normal fault
2.5-3.0m vertical
offset (throw)
N side of tape

53.0-55.0m - S side of tape
8 major fractures
 \perp to line (F_1)

10/3/02 KCB
UNIT B -
Sample
collected by
D.H.
0' / 78' W
Between major frac
system (F_1) is
system of \perp smaller
fracs to F_1 - these
are F_2 again - see
digital photos

From Page No. 70
Project No. _____
Book No. _____
TITLE _____
Project No. _____
Book No. _____
73

RF
128 4/10/03
Bishop

KCB
9/15/02

63.5 - 67.5m - transition zone
between Units B &
Unit C

67.5m → Unit C -
Very well welded tuff -
color = light brown

66m → Low fr set confined
to Unit C
N75W 24 SW

66.0 - 68.2m - 11 major frags

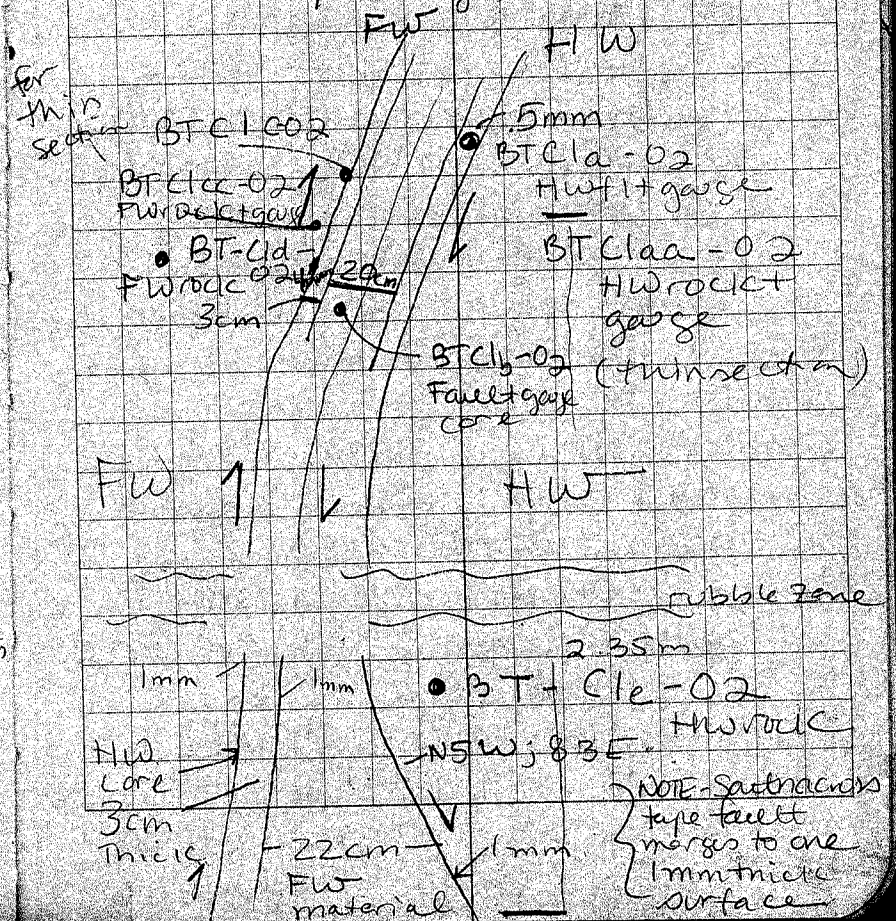
68.2 - 75.0m - 16 frags
- 3 sets
a) // to line = F,
b) // to Bedding / Deposition
N20 W, 2 NE
c) vertical cooling joints
S64 E 85 SW

10/3 Sample
Unit C - @ 75.0m - welded tuff
top
bottom
N 30 W 12 NE

RF
4/10/03
KCB
9/15/02

Bishop

Fault Description @ 53.5m
- S15W 82NW
(Footwall fault surface)
- THROW = 2.35m
- Layered fault gouge
w/ clay, sand



RF
128 4/10/03
BISHOP -

KCB
9/16/02

Cynthia Dinsidlie, Dan Banno,
Ran, & Dick Heerman, Kelly
@ Chalk Cave Site

~ arrive @ site - wait ~ 50min
for CWREA people to arrive
loadup, pack and haul
equipment up slope to site
~ set up transect line
cynthia wants it parallel
& overlying CC2 - outcrop
is pretty disturbed
therefore we align line
as best as possible
0m - 557cm

cynthia wants grain
size analysis around
each test hole
as CWREA folks start
miniperm survey dick and
i collect grain size
samples along CCHP1

RF
4/10/03
KCB
9/16/02

Bishop

grain size sampling -
use chisel & rock hammer
to dig out around
circumference of each hole
and inward following
outer perimeter of hole
to get representative
sample around each
miniperm seal

~ rocks here are quite
homogeneous along line
some poorly welded
massive med orange pink
unit w/ pumice clasts
sampling around each
hole seems excessive
~ in lab try through
fracture zone - if grain
size maintains regularity
maybe skip to every
50cm for tests as
they can take a long
time to sieve and weigh

~ Believe perm variations are
a result of fracture distribution @
this site and not grain size

Project No. 72
Book No. 72
TITLE
Project No. 73
Book No. 73
TITLE

4/16/02 ✓ collected

KCB 9/16/02

- Sample from 0-3m along CCHW1
- Sample ID * Holes @ this site are still preserved
- CCHW1-0m = sample from CCHW1 @ 0cm site
 - CCHW1-5cm - " " identification continues w/ nomenclature above
 - CCHW1 10cm - ✓
 - CCHW1 20cm ✓
 - CCHW1 30cm ✓
 - CCHW1 40cm ✓
 - CCHW1 50cm ✓
 - CCHW1 60cm ✓
 - CCHW1 70cm ✓
 - CCHW1 80cm ✓
 - CCHW1 90cm ✓
 - CCHW1 100cm ✓
 - CCHW1 110cm ✓
 - CCHW1 120cm ✓
 - CCHW1 130cm ✓
 - CCHW1 140cm ✓
 - CCHW1 150cm ✓
 - CCHW1 160cm ✓
 - CCHW1 170cm ✓
 - CCHW1 180cm ✓
 - CCHW1 190cm ✓
 - CCHW1 200cm ✓
 - CCHW1 210cm ✓
 - CCHW1 220cm ✓
 - CCHW1 240cm ✓
 - CCHW1 250cm ✓
 - CCHW1 260cm ✓
 - CCHW1 270cm ✓
 - CCHW1 280cm ✓
 - CCHW1 290cm ✓
 - CCHW1 300cm ✓

RF 4/16/02

KCB 9/16/02

Biohap

Sampling along CCHW1 3-6m

- CCHW1 300cm - ✓
- CCHW1 320cm - ✓
- CCHW1 340cm ✓
- CCHW1 360cm ✓
- CCHW1 380cm ✓
- CCHW1 400cm ✓
- CCHW1 420cm ✓
- CCHW1 440cm ✓
- CCHW1 460cm ✓
- CCHW1 480cm ✓
- CCHW1 500cm ✓
- CCHW1 520cm ✓
- CCHW1 540cm ✓
- CCHW1 560cm ✓
- CCHW1 580cm ✓

* Samples collected by Dick & Kelly and will be taken to USU for grain size analysis w/ sieves

4/16/02 RF

KCB 9/17/02

Biohap

Cynthia, Don, Ron, Dick, Kelly

Sampling for Thin Sections @ Chalk cave - to compare w/ perm data.

- BT-99-02 - see CCHW1 map
- sample between HWFr 2 & HWFr 3
- 2.5m South ^{RF 10/4/02} North of transect line
- ~ 85cm loci pt along transect line @ west edge of sample face
- ~ sample is between 75-85cm from fault
- * - XRD + THIN SECTION

BT-100-02 - see CCHW1 map

- 20cm South @ 270cm on transect CCHW1 in FeOx zone

Here C.D. in widdle has little data therefore here is to look @ sample and get relative / qual description of re-orientation

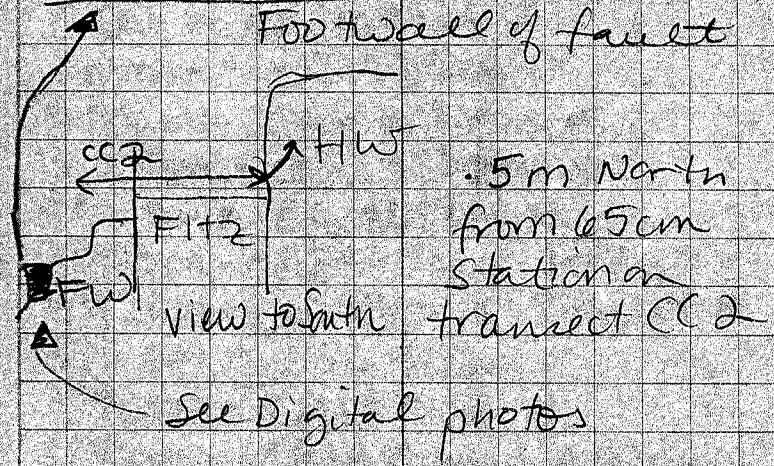
RF 4/16/02

KCB 9/17/02

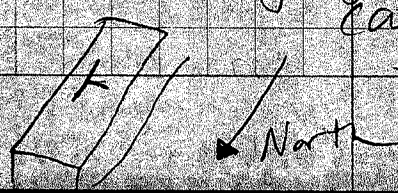
Biohap

BT-101-02 - CCHW1 near 580cm 13cm from midpt of 580cm and 15cm West of 580cm near Guelph Test Site #4 (6P4)

BT-102-02 - CC2 transect map Footwall of fault



BT-103-02 - see CC2 maps sample of fault core gauge of chalk cave fault for thin section + xrd



LA PF 4/2/03
Bishop

KKB
9/17/02

- Ron is conducting bench tests to
some of these are taking an incredibly
long time - too long -
need to speak w/ Randy
wrt to how long a test
should take before you
decide to drill a new
hole

- Cynthia & CWRA folks
continue C2 perm
tests

- Dick and I head to
Cruzifix site for
grain size analysis
sample collection
along two transects

remember to look @
- bulph + est data from
chalk core - seems Eut
test runs much slower
than those in HW or
in fault zone

check this hypothesis w/
Randy

PF 4/2/03
KKB
9/17/02

Bishop
Cruzifix Site

Upper Bed - c-f - u - cf 1
(Dick collecting samples)

- top loci - based on prev. mapping
- 25cm - cfu 25cm (actual sample site)
- 72cm - cfu 72cm ✓
- 130cm - cfu 130cm ✓
- 175cm - cfu 165cm ✓
- 205cm - cfu 195cm ✓
- 270cm - cfu 270cm ✓
- 325cm - cfu 325cm ✓
- 365cm - cfu 365cm ✓
- 397cm - cfu 397cm FAULT ✓
- 447cm - cfu 447cm FAULT ✓
- 515cm - cfu 515cm ✓
- 570cm - cfu 570cm ✓
- 610cm - cfu 610cm ✓
- 650cm - cfu 650cm ✓
- 700cm - cfu 700cm ✓
- 750cm - cfu 750cm ✓
- 800cm - cfu 800cm ✓
- 850cm - cfu 850cm ✓
- 900cm - cfu 900cm ✓
- 950cm - cfu 950cm ✓
- 972cm - cfu 972cm ✓
- 967cm - cfu 967cm ✓ + 1050cm ✓
- 1000cm - cfu 1000cm ✓

Bishop

KKB
9/17/02

Brain Size Sampling - cfl -
Cf 2 transect
lower bed

- Station - sample name - loci
- 0m - cfl 0m
- 50cm - cfl 50cm
- 109cm - cfl 110cm
- 152cm - cfl 152cm
- 195cm - cfl 195cm
- 230cm - cfl 230cm
- 250cm - 250cm cfl
- 300cm - cfl 300cm
- 490cm - cfl 490cm
- 535cm - cfl 535cm
- 585cm - cfl 585cm
- 625cm - cfl 625cm
- 675cm - cfl 675cm
- 725cm - cfl 725cm
- 775cm - cfl 775cm
- 825cm - cfl 825cm
- 870cm - cfl 870cm
- 925cm - cfl 925cm
- 955cm - cfl 955cm
- 970cm - cfl 970cm FAULT
- 975cm - cfl 975cm
- 1025cm - cfl 1025cm

Bishop

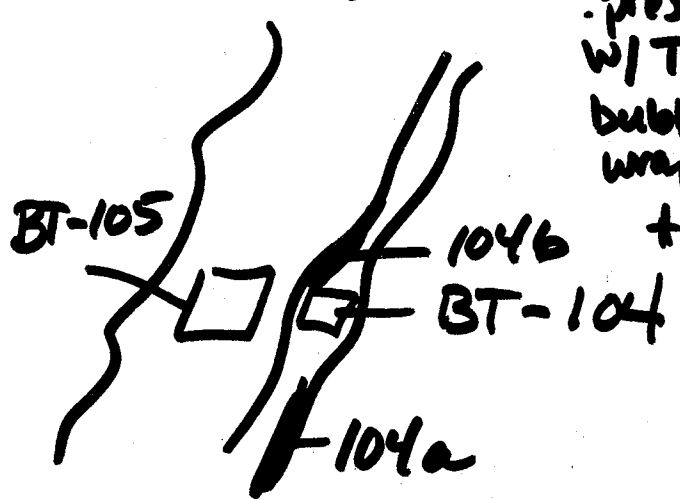
KKB
9/17/02

Cruzifix Site - Sampling
for thin sections; xrel

BT-104a-02
cf fault
fault core gauge
runs parallel to
fault surfaces

BT-105-02 - fault core
parallel to previous

BT-104b-02 -
Clay gauge samples
preserved
w/TP;
bubbles
wrap +
tape

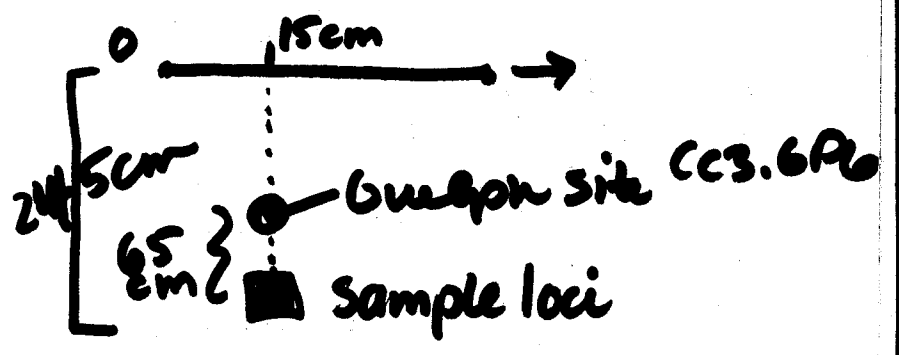


Bishop
KKB 9/18/02 Grain Size
~~test hole~~ sampling
@ chalk cone
along transect CC3
every 10cm - to follow
C. Dinwiddie

- 0 - CC3 0cm ✓
- 10 - CC3 10cm ✓
- 20 - CC3 20cm ✓
- 30 - CC3 30cm ✓
- 40 - CC3 40cm ✓
- 50 - CC3 50cm ✓
- 60 - CC3 60cm ✓
- 70 - CC3 70cm ✓
- 80 - CC3 80cm ✓
- 90 - CC3 90cm ✓
- 100 - CC3 100cm ✓
- 110 - CC3 110cm ✓
- 120 - CC3 120cm ✓
- 130 - CC3 130cm ✓
- 140 - CC3 140cm ✓
- 150 - CC3 150cm ✓
- 160 - CC3 160cm ✓
- 170 - CC3 170cm ✓
- 180 - CC3 180cm ✓

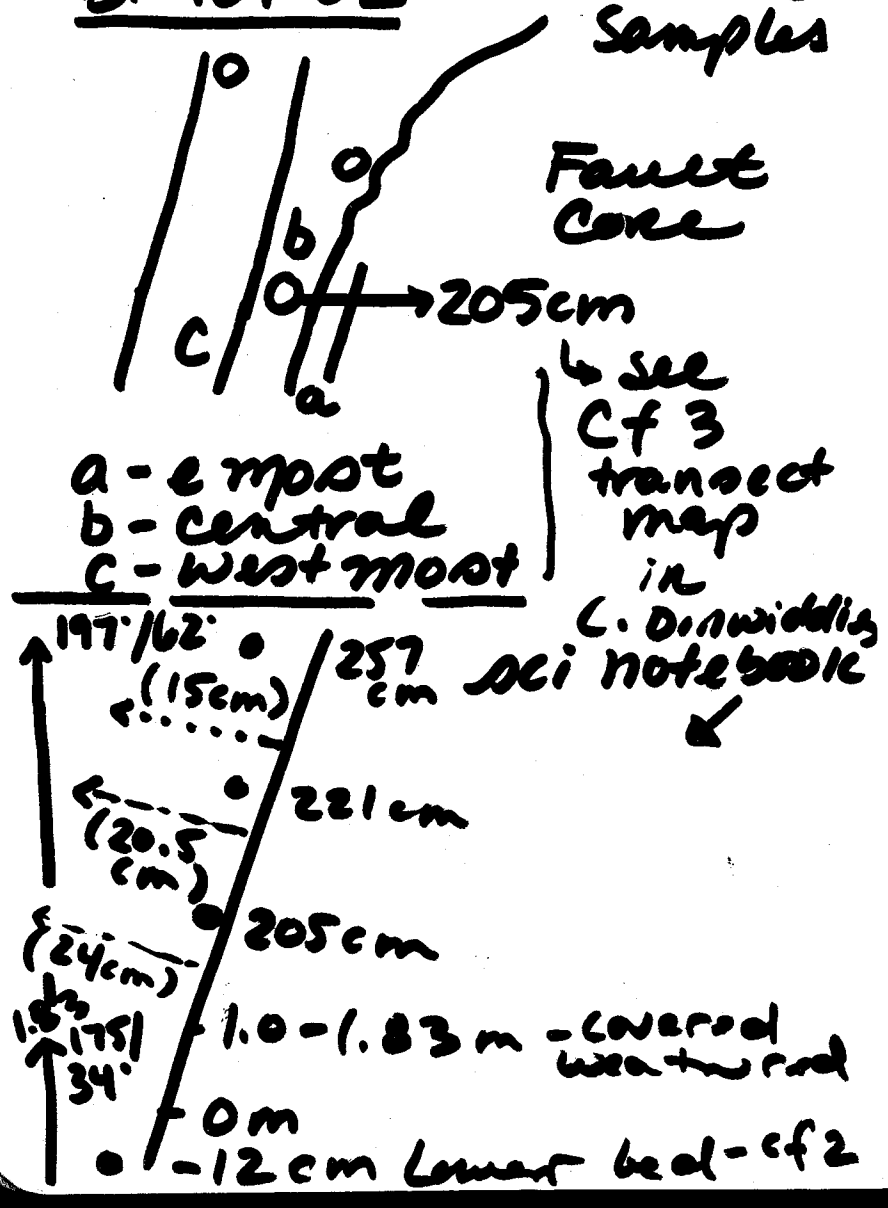
Recorded by

Bishop
KKB 9/18/02
Chalk Cone:
Geulphn sample for
CC3. G P 6



Crucifix:
BT-106-02 - from Cf2
- loci @ 465-470cm
and 25cm above tape
- fault surface on
E wedge fault
Cf(1) = Cf1
Cf(2) = Cf2

Bishop
KKB 9/18/02
BT-107-02 - Fault Core
Samples



Recorded by

Bishop
KKB 9/18/02
@ 107b test hole
w/in test hole
see appearance
of clay smear
along hole surface
~ is it possible that
if presence of clay
in tuffs that
drilling of holes
produces a type of
clay smear that
affects permeability
Check perm. readings -
@ 205cm K = 900 md

@ near "a" dampness
|| to fault

Bishop

KKB
9/18/02

TO DO:

- Plot holes along CC3
- Pick guelph test site
- Sample guelph site for H₂O content analysis

~ While sampling @ guelph pits @ CC2 notice fracture surfaces are somewhat damp up to 60 cm away (N) from hole @ GP6

60 cm away (N) of GP5

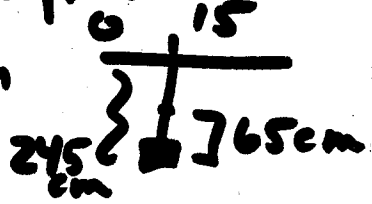
80 cm (S) from GP3 still damp parallel to fracture

Bishop

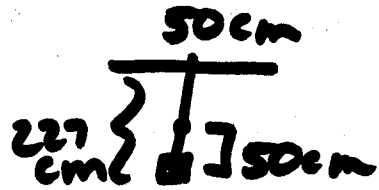
KKB
9/18/02

H₂O content samples:

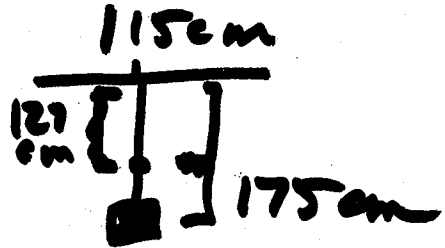
- CC3.GP6
8.5 x 6.5 cm
6 x 6
5.5 x 11
4 x 10.5
5 x 6
10.5 x 7



- CC3.GP5
4 x 5.7 cm
4 x 8.7
6.5 x 5
4.5 x 8.3
6.3 x 8.3
6.4 x 8.4

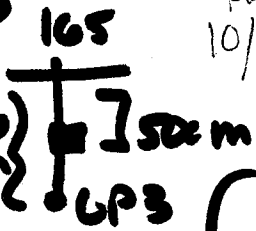


- CC3.GP4
4.5 x 4.5
5.7 x 5.3
6 x 11
6 x 11
5.4 x 10
6 x 10



CC3.GP3

- 4 x 3
- 3 x 3.5 (180)
- 9 x 3.8 cm
- 9 x 4
- 8.5 x 4
- 9 x 4



KKB
9/18/02

10/18/02 KKB

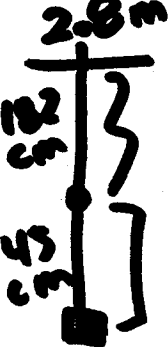
CC3.GP2

- 9 x 10
- 6 x 9
- 5 x 9
- 7 x 4.5
- 10 x 6
- 9 x 9



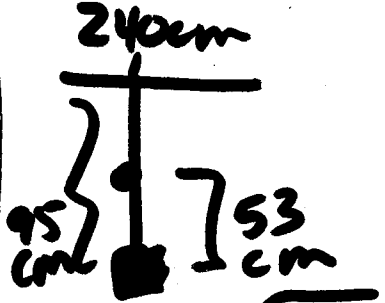
CC3.GP1

- 11 x 11.5
- 4 x 10.5
- 3 x 5
- 10 x 5.5
- 9 x 4.5
- 10.5 x 12



CCHW1 - GP6

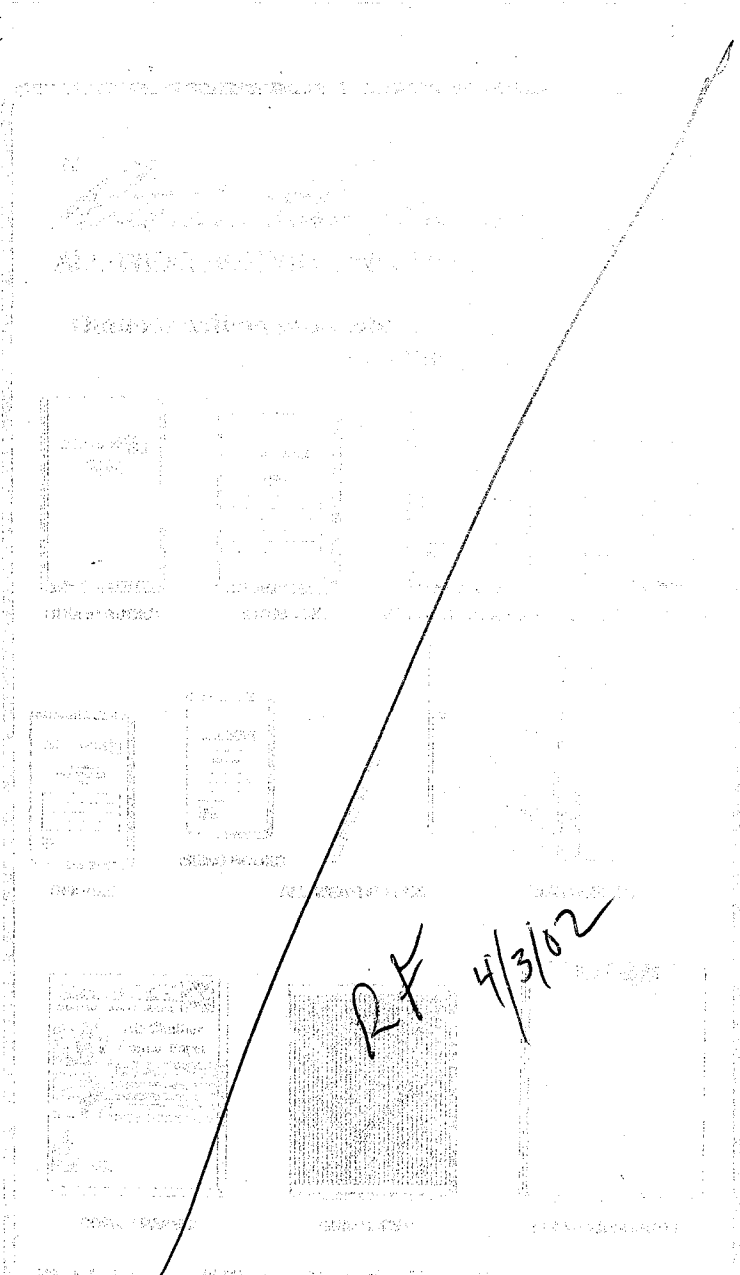
- 12 x 6
- 15 x 7
- 12 x 5
- 12 x 6
- 15 x 15
- 15 x 13



GP7 - 187 cm

GP8 - 315 cm

For GP7 & GP8: Dick will collect & send data



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From Page No. _____

Next to Last Entry for Scientific Notebook # 515

(see continuation in # 583)

RF 4/3/02

Last Entry:

Note that pages 5 to 65 have a second xerox taped over the original xerox. The 2nd xerox includes corrections for initialing/dating cross-outs & contains more readable xeroxes.

None of the informational content of the original xerox was changed in the 2nd xerox, which can be verified since both xeroxes remain in this book.

RF 4/3/02

I have reviewed this SN and find that it generally complies with GAP-cc. The information herein is sufficient for a well trained field geologist to understand the field and laboratory studies conducted as part of this campaign.

Jason Wittman

9/21/2004

To Page No. _____

Witnessed & Understood by me,

CLD

Date

11/14/03

Invented by

Recorded by

Date

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK NO. 515

Document Date:	04/15/2002
Availability:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, Texas 78228
Contact:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, TX 78228-5166 Attn.: Director of Administration 210.522.5054
Data Sensitivity:	<input checked="" type="checkbox"/> "Non-Sensitive" <input type="checkbox"/> Sensitive <input type="checkbox"/> "Non-Sensitive - Copyright" <input type="checkbox"/> Sensitive - Copyright
Date Generated:	06/04/2004
Operating System: (including version number)	Windows
Application Used: (including version number)	various
Media Type: (CDs, 3 1/2, 5 1/4 disks, etc.)	1 - CD
File Types: (.exe, .bat, .zip, etc.)	jpg, ppt, db
Remarks: (computer runs, etc.)	Media contains: data files dealing with structural characterization of Bishop tuff and hydrologic implications of fracture systems and lithology in the unsaturated zone