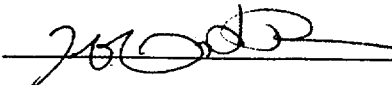

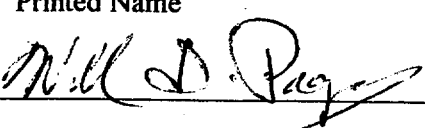
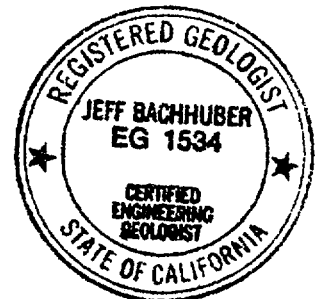


**DATA REPORT D**  
**TRENCHES IN THE ISFSI STUDY AREA**  
**DIABLO CANYON ISFSI**

PREPARED BY	<u></u>	DATE	<u>12/17/01</u>
	<u>Jeff L. Bachhuber</u>		<u>William Lettis &amp; Associates, Inc.</u>
	Printed Name		Organization
VERIFIED BY	<u></u>	DATE	<u>12/17/01</u>
	<u>Scott C. Lindvall</u>		<u>William Lettis &amp; Associates, Inc.</u>
	Printed Name		Organization
APPROVED BY	<u></u>	DATE	<u>12/17/01</u>
	<u>William D. Page</u>		<u>PG&amp;E Geosciences Dept.</u>
	Printed Name		Organization



**DATA REPORT D**  
**TRENCHES IN THE ISFSI STUDY AREA**  
**DIABLO CANYON ISFSI**

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### **List of Attachments**

Attachment 1	Field Trench Logs
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**DCPP ISFSI SAR**  
**Data Report D**  
**Trenches in the ISFSI Study Area**

## **1.0 INTRODUCTION**

Twenty-two shallow (1- to 8- feet-deep) trenches (designated T-1 to T-22) with cumulative length of about 1,510 feet, were excavated and logged at the Diablo Canyon ISFSI study area to obtain information on bedrock stratigraphy and rock mass properties (Figures D-1 and D-2). The trenches expose marine sedimentary rocks of unit Tof<sub>6</sub> of the Tertiary Obispo Formation and Holocene colluvium. Discontinuity surveys of joints, fractures and bedding (William Lettis & Associates, Inc., 2001, Diablo Canyon ISFSI Data Report F), as well as rock mass evaluations (William Lettis & Associates, Inc., 2001, Diablo Canyon ISFSI Data Report H) were performed in the trenches to obtain information to assess slope stability and in situ rock strength. The preparation of this data report was performed under the 2000 WLA Work Plan (William Lettis & Associates, Inc., Work Plan, 2000) using data collected under that Work Plan and the 2001 WLA Work Plan (William Lettis & Associates, Inc., Work Plan, 2001) .

## **2.0 METHODOLOGY**

Trenches were excavated with a rubber-tire backhoe or track-mounted excavator (Figure D-3), depending on the competence of the rock encountered. Excavation was easy and rapid in zones of friable, weathered, or closely jointed rock. In more massive rock, excavation was moderately difficult to difficult, and some trenches could not be extended more than 6 inches to 2 feet before meeting refusal. Site geologists supervised the trench excavations, cleaned the trench sidewalls with picks, shovels, and brooms, and logged the exposures. The geologists were Jeff Bachhuber, Charles Brankman, John Helms, John Baldwin and Rich Koehler of William Lettis & Associates, Inc. (WLA). Sedimentary beds and fault contacts, including structural features, were flagged with nails and colored plastic survey tape. Logs of the trench exposures were prepared at scales ranging from 1:40 to 1:160 to document rock lithology, structure, and lithologic contacts and are included in this Data Report. Measurements of bedding, joint, and fault orientations were made with a Brunton compass. Discontinuity surveys were performed in selected trenches by extending a fiberglass survey tape across the trench floor or sidewall, and

measuring the station, attitude and characteristics of discontinuities that intercepted the tape. This information is documented on field data sheets in William Lettis & Associates, Inc. (2001) Diablo Canyon ISFSI Data Reports F and H. Photographs of the trenches are included as Figures D-4 to D-25. Following the logging of trenches, the ends of the trenches and selected fault zones were surveyed by a licensed land surveyor. This surveyed data was transmitted by PG&E Geosciences Department to WLA (PG&E Geosciences, 2001).

### 3.0 RESULTS

Rock encountered in the trenches consisted of dolomite, dolomitic siltstone, dolomitic sandstone, and sandstone of the Obispo Formation subunit "b". This subunit was further divided into two other units:  $Tof_{b-1}$  dolomite, and  $Tof_{b-2}$  sandstone. The distribution of these rock types is shown on the trench logs. Intervals of friable rock were found in some trenches in the dolomite and sandstone, and are differentiated on the trench logs as friable rock and designated as  $Tof_{b-1a}$  and  $Tof_{b-2a}$ , respectively. These rock types are described in William Lettis & Associates, Inc. (2001), Diablo Canyon ISFSI Data Report A.

The trenches primarily encountered dolomite in the middle ( $Tof_{b-1}$ ) and upper parts of the slope above the ISFSI site (e.g., trenches T-2, T-4, T-11), with irregular zones and beds of friable (block-in-matrix) dolomite ( $Tof_{b-1a}$ ) (e.g., trenches T-6, T-20). Cemented dolomitic sandstone ( $Tof_{b-2a}$ ) and friable sandstone ( $Tof_{b-2a}$ ) were encountered in the trenches along the downhill (northern) margin of the slope at the ISFSI site (e.g., trenches T-1, T-17). Clay beds ranging in thickness up to 4 inches are present in five trenches (trenches T-11, T-12, T-14, T-15, T-19). Of the total 1500 feet of trench exposure at the ISFSI study area, the approximate proportions of rock encountered were dolomite - 69%, friable dolomite - 12%, sandstone - 8%, friable sandstone - 10%, and shear zones, excavation rubble, and clay beds - 1%.

Five minor bedrock faults were encountered in trenches along the northern (downhill) margin of the site (e.g., trenches T-1, T-17). The faults strike west-northwest, are steeply dipping to vertical, and juxtapose rocks of different lithologies (Figure D-1). The sense of vertical separation generally is down to the northeast. Slickensides generally are subhorizontal. Combined, the sense of vertical separation and slickensides data indicate primarily right lateral strike slip on the minor faults.

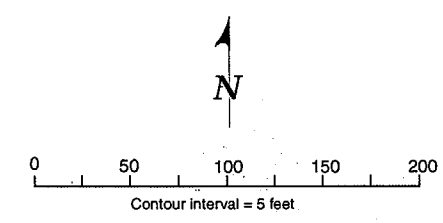
At the end of the study, the lithologic characteristics of the rocks in the trenches were re-evaluated and reclassified and the original unit names depicted on the trench logs were corrected to conform with the final stratigraphic nomenclature used for the ISFSI study area. These changes have been noted on the logs in this Data Report.

#### **4.0 REFERENCES**

- Hartz, C.E., no date, ISFSI Site Investigation DCP, EDMS Item #993500012, 10 CFR 50 Appendix B, Criterion III, 12 p.
- PG&E Geosciences Department, 2001, Memo from William D. Page to Rob Witter of October 26, 2001, Transmittal of additional maps and plans for the DCP Used Fuel Storage project for Calculation Package GEO.DCP.01.21, Analysis of bedrock stratigraphy and geologic structure at the DCP ISFSI Site.
- William Lettis & Associates Work Plan, Additional Geologic Mapping, Exploratory Drilling, and Completion of Kinematic Analyses for the Diablo Canyon Power Plant, Independent Spent Fuel Storage Installation Site, Rev. 2, November 28, 2000.
- William Lettis & Associates, Inc., Work Plan, Additional Exploratory Drilling and Geologic Mapping for the DCP ISFSI Site, Rev. 1, September 19, 2001.
- William Lettis & Associates, Inc., 2001, Diablo Canyon ISFSI Data Report A, Rev. 1, Geologic Mapping in the Plant Site Area and ISFSI Study Area.
- William Lettis & Associates, Inc., 2001, Diablo Canyon ISFSI Data Report F, Rev. 1, Field Discontinuity Measurements.
- William Lettis & Associates, Inc., 2001, Diablo Canyon ISFSI Data Report H, Rev. 1, Rock Strength Data and GSI Sheets.

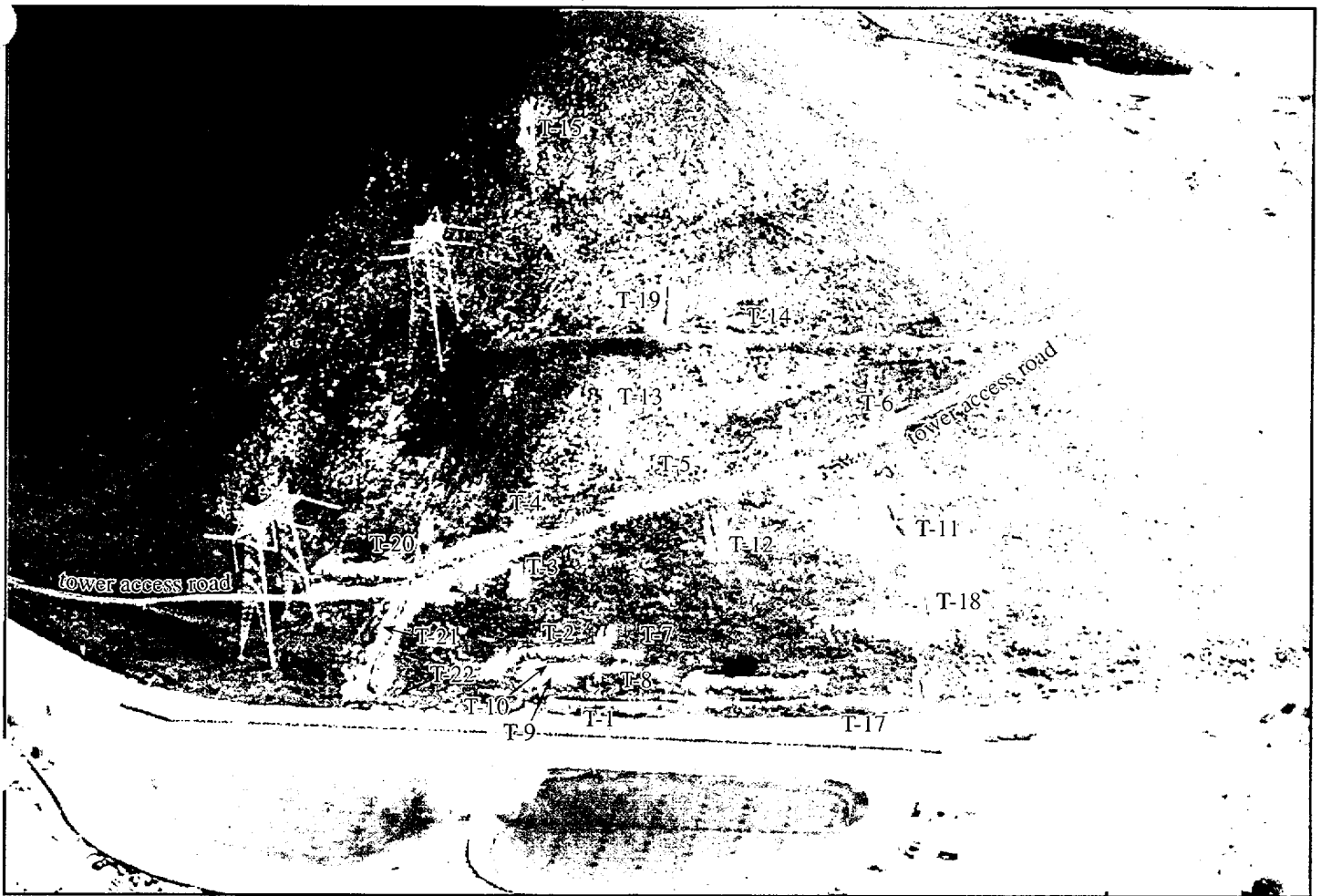


- Explanation**
- T-3 Exploratory trench, number indicated
  - Footprint of 500 kV tower
  - Outline of ISFSI Pads
  - Cutslope above, and fill prism west of, ISFSI pads



**DIABLO CANYON ISFSI**

**FIGURE D-1**  
**LOCATION OF EXPLORATION TRENCHES**



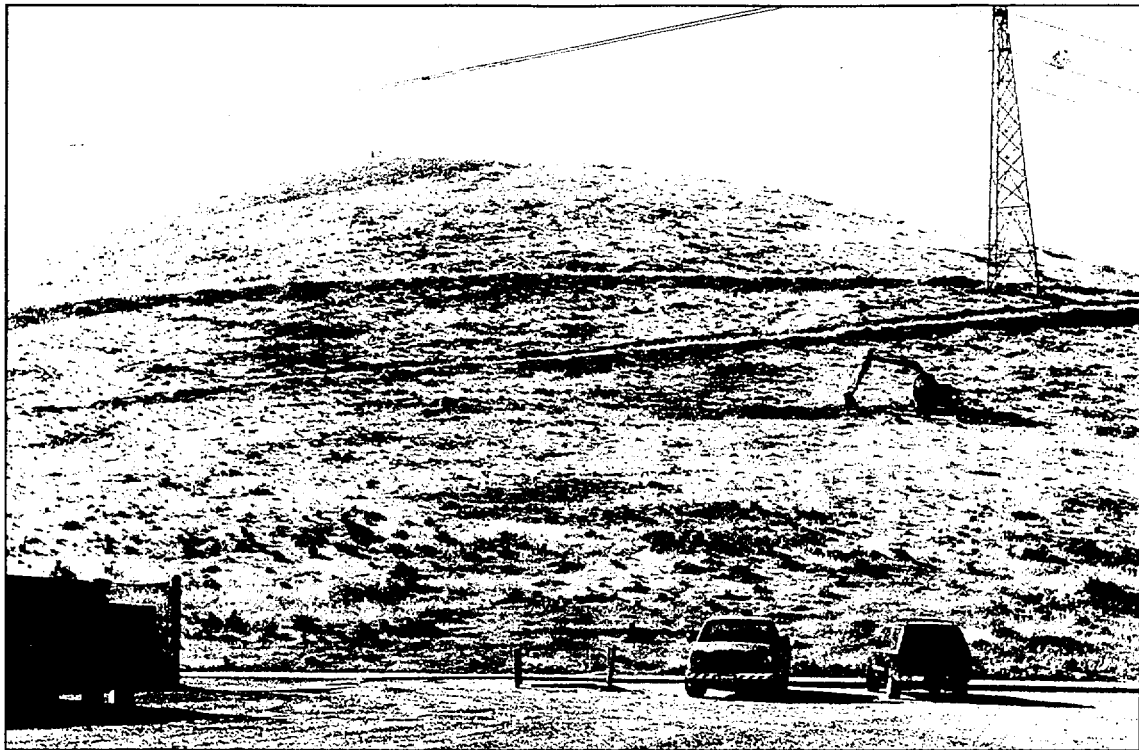
(Roll 01 AR3-25)

Southward view of ISFSI study area in center of photo above raw water reservoir. Outcrops of dolomite mark the borrow area cutslope. Trenches excavated for the ISFSI Site investigation are shown. Trench T-16 is located to the left and off of the photo. Photo obtained prior to excavation of T-22 at approximate location marked on photo.

## DIABLO CANYON ISFSI

**FIGURE D-2  
SOUTHWARD VIEW OF ISFSI STUDY AREA**





(Roll 00 JLB-2)

Excavation of trench T-11, view to the south.

## DIABLO CANYON ISFSI

### FIGURE D-3 EXCAVATION OF TRENCH T-11, VIEW TO SOUTH



(Roll 00 JLB-1)

Altered sandstone (blue-gray color) and dolomite (tan color at far end of trench) in trench T-1. Hammer and orange stake at top of trench across from geologist mark location of a small fault.

## DIABLO CANYON ISFSI

### FIGURE D-4 TRENCH T-1, VIEW TO NORTHEAST



(Roll 00 JLB-1)

Typical blocky dolomite exposed in trench T-2.

## DIABLO CANYON ISFSI

### FIGURE D-5 TRENCH T-2, VIEW TO NORTHEAST



(Roll 00 00024.JPG)

Typical blocky dolomite in trench T-3. Excavator could not rip hard rock in trench bottom, and met practical refusal.

## DIABLO CANYON ISFSI

**FIGURE D-6  
TRENCH T-3, VIEW TO THE NORTHEAST**



(Roll 00 00027.JPG)

Blocky dolomite in trench T-4 along tower across road.

## DIABLO CANYON ISFSI

### FIGURE D-7 TRENCH T-4, VIEW TO THE NORTHEAST

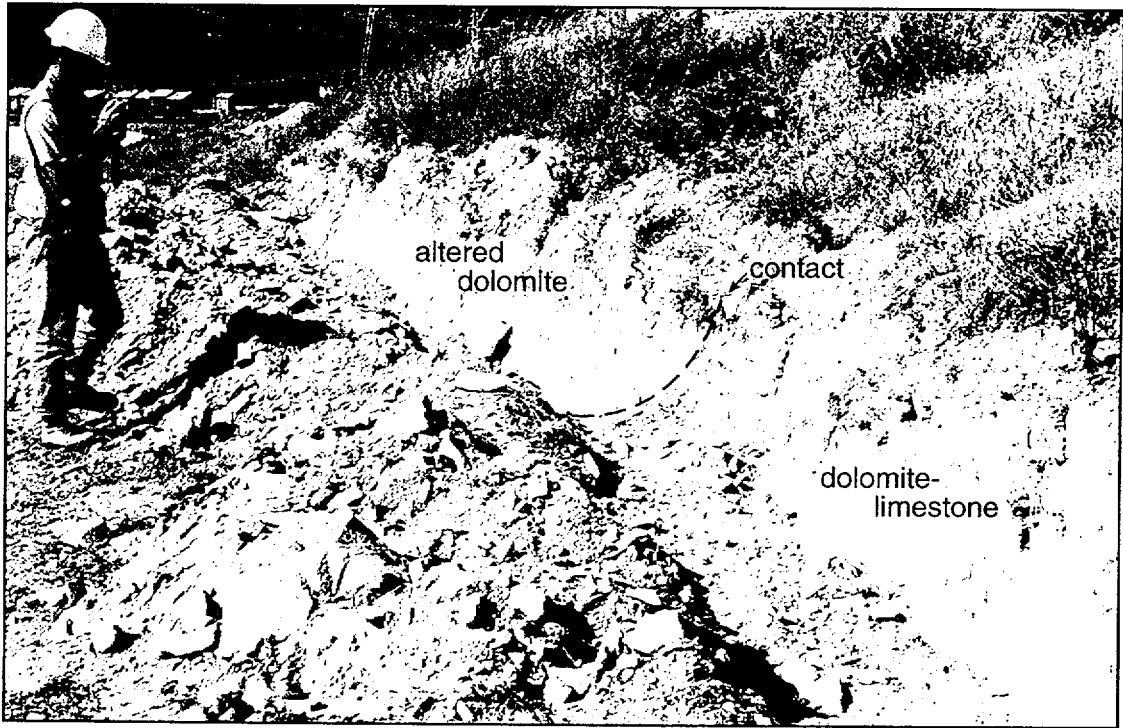


(Roll 00 JLB-2)

Blocky to massive dolomite in trench T-5.

## DIABLO CANYON ISFSI

### FIGURE D-8 TRENCH T-5, VIEW TO NORTH



(Roll 00 JLB-2)

Massive altered dolomite and blocky dolomite-limestone in trench T-6.

## DIABLO CANYON ISFSI

**FIGURE D-9**  
**TRENCH T-6, VIEW TO THE NORTH**



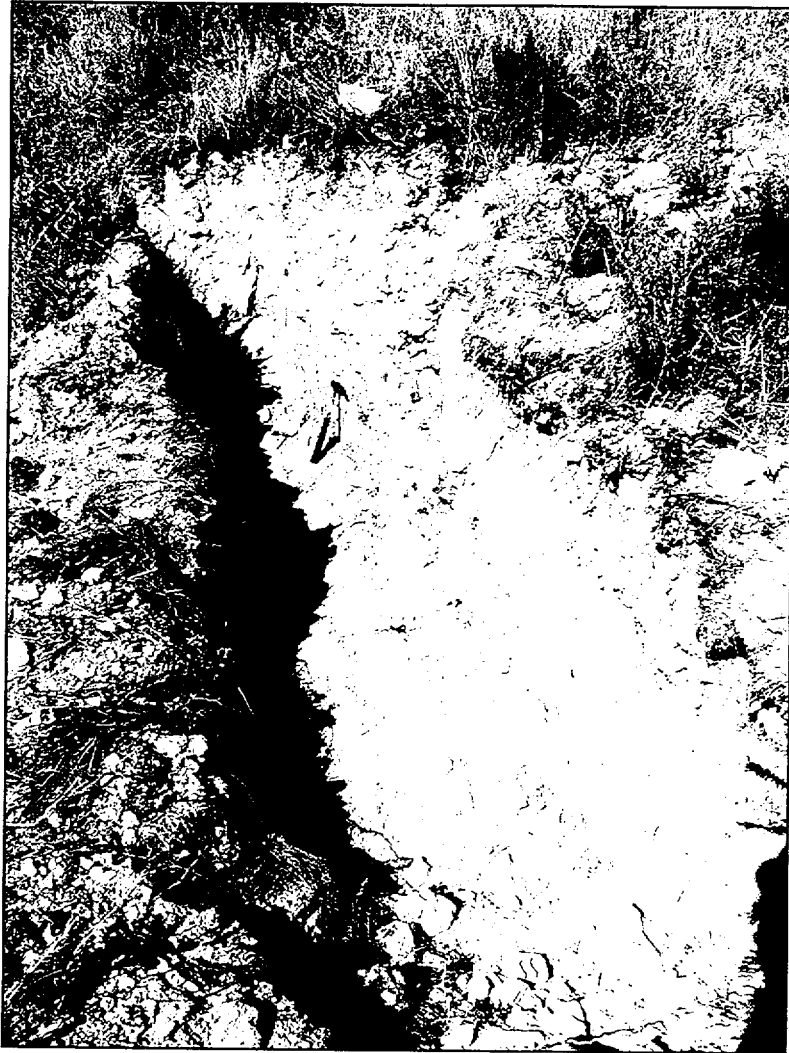
(Roll 00 00047.JPG)

Blocky dolomite (tan) and altered sandstone (blue-gray) in trench T-7.  
Several small secondary faults are marked by red survey flagging.

## DIABLO CANYON ISFSI

**FIGURE D-10**  
**TRENCH T-7, VIEW TO THE NORTHEAST**





(Roll 00 00050.JPG)

Dolomite and altered sandstone in trench T-8. Several small secondary faults are marked by red survey flagging.

## DIABLO CANYON ISFSI

### FIGURE D-11 TRENCH T-8, VIEW TO THE NORTHEAST



(Roll 01 JLB-1)

Sandstone in trench T-9.

<b>DIABLO CANYON ISFSI</b>
<b>FIGURE D-12 TRENCH T-9</b>

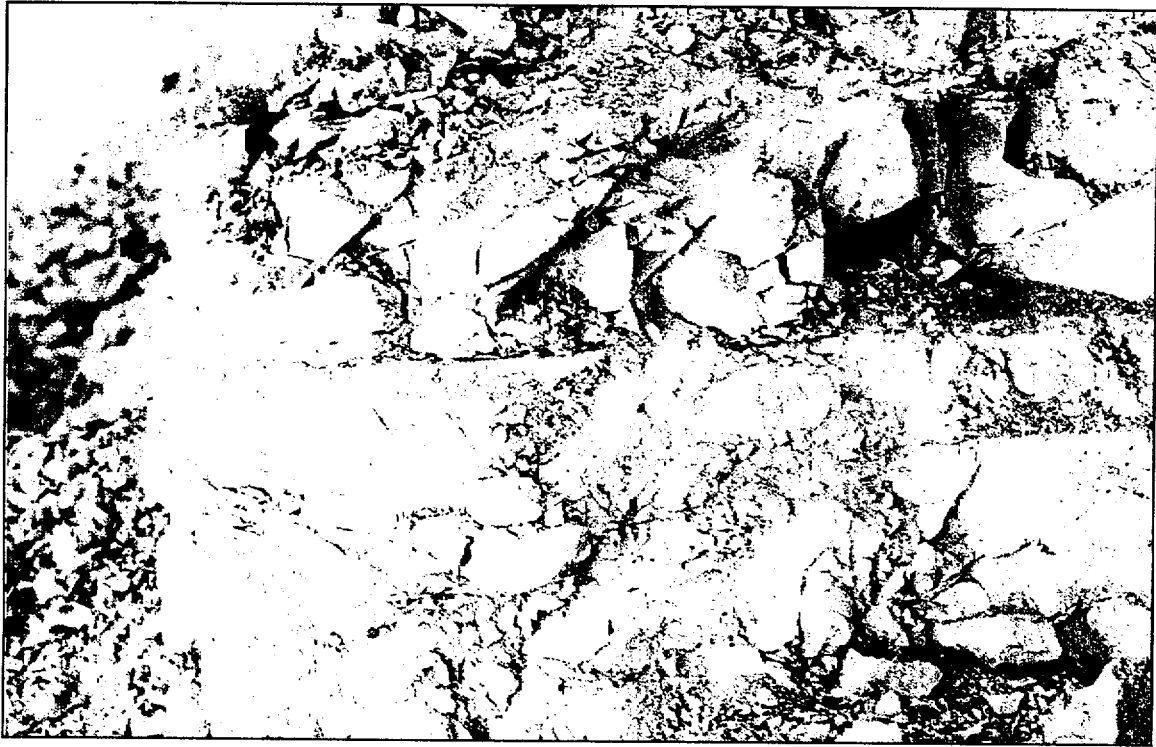


(Roll 00 00031.JPG)

Blocky dolomite in trench T-10.

## DIABLO CANYON ISFSI

**FIGURE D-13**  
**TRENCH T-10, VIEW TO THE SOUTHEAST**

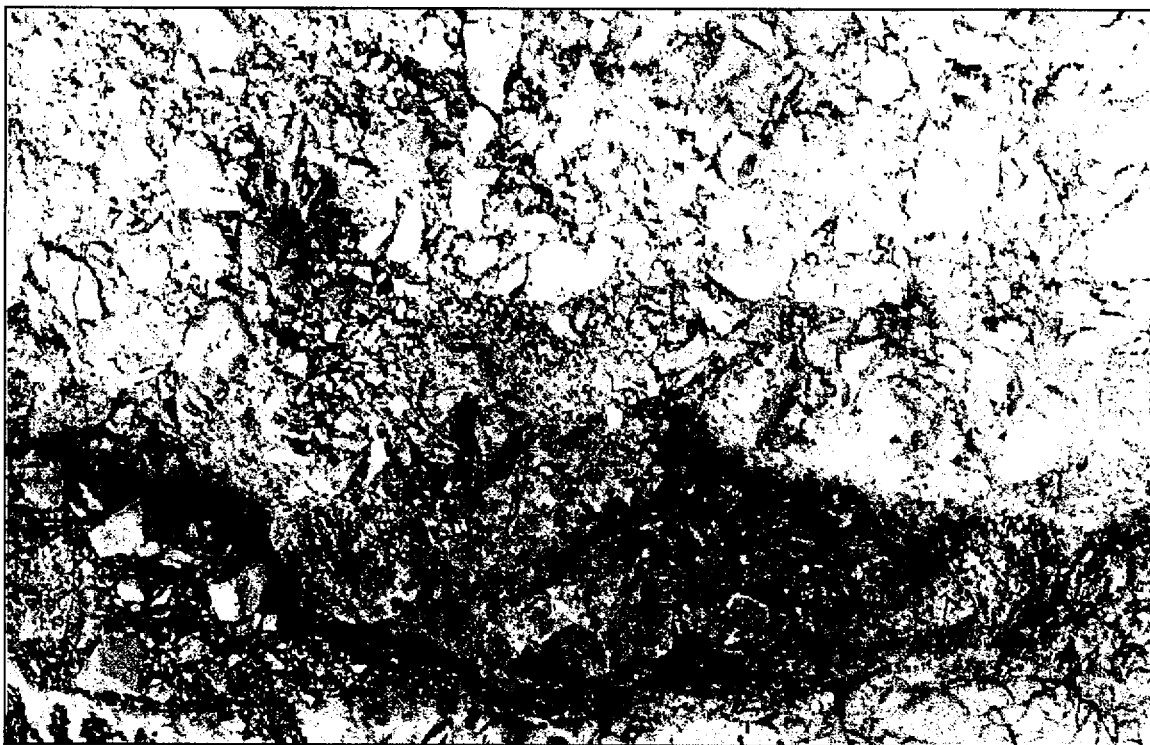


(Roll 01 JLB-1)

Clay beds within the dolomite in T-11C.

## DIABLO CANYON ISFSI

### FIGURE D-14 TRENCH T-11



(Roll 01 JLB-1)

Dolomite in trench T-12.

**DIABLO CANYON ISFSI**

**FIGURE D-15  
TRENCH T-12**



(Roll 00 JLB-4)

Massive to blocky dolomite in trench T-13. Hard rock beds could not be ripped by excavator, limiting depth of trench.

## DIABLO CANYON ISFSI

**FIGURE D-16**  
**TRENCH T-13, VIEW TO NORTHWEST**



(Roll 00 JLB-3)

Blocky dolomite and clay bed in trench T-14.

## DIABLO CANYON ISFSI

FIGURE D-17  
TRENCH T-14, VIEW TO NORTHEAST



(Roll 01 JLB-1)

Blocky dolomite in trench T-15.

<b>DIABLO CANYON ISFSI</b>
<b>FIGURE D-18 TRENCH T-15</b>



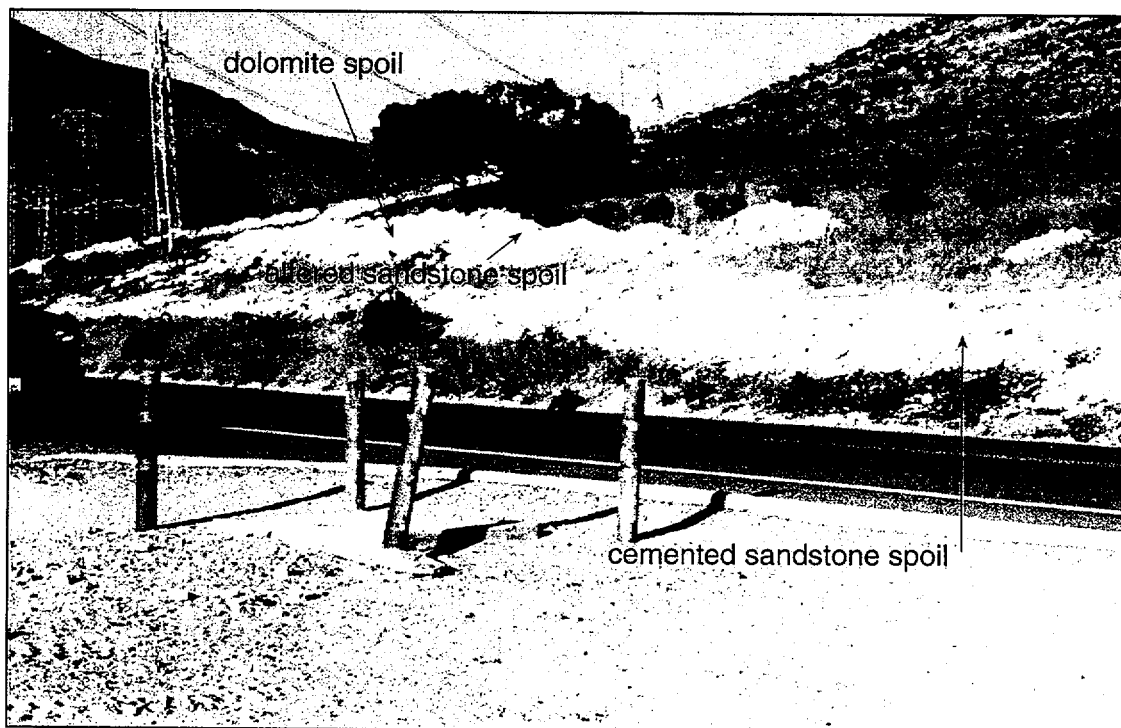


(Roll 00 00055.JPG)

Thick clay colluvium in trench T-16.

## DIABLO CANYON ISFSI

### FIGURE D-19 TRENCH T-16, VIEW TO THE SOUTH

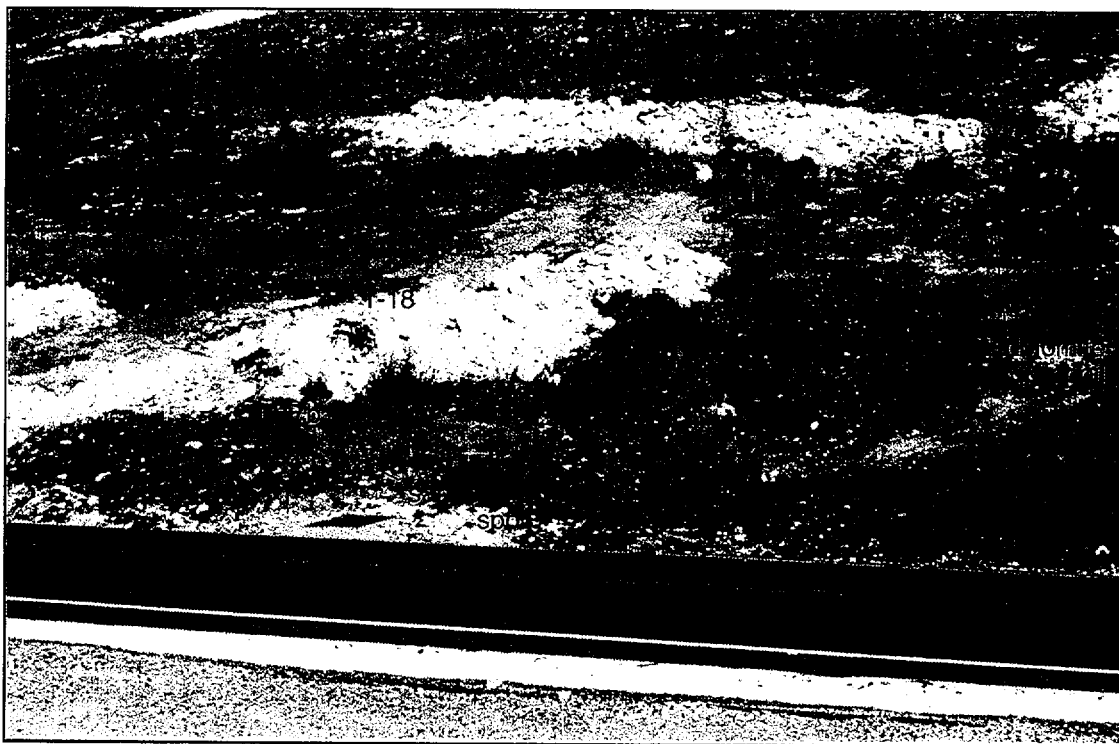


(Roll 00 JLB-8)

Distant view of trench T-17. Trench spoil piles show general locations of different rock types encountered at equivalent locations in the trench. Tan rock spoil along the right (near) part of the trench is derived from cemented sandstone. Blue-gray spoil in the middle and distant part of the trench is from altered sandstone. Tan spoil at the far end of the trench is from dolomite.

## DIABLO CANYON ISFSI

**FIGURE D-20**  
**TRENCH T-17 (FOREGROUND ALONG RESERVOIR**  
**ROAD) VIEW TO THE SOUTHEAST**



(Roll 00 JLB-8)

Trenches T-17b, and T-18, and T-11, and associated spoil piles. Trench T-17b exposed cemented sandstone of unit Tof<sub>b-2</sub>, and trenches T-11 and T-18 encountered dolomite of unit Tof<sub>b-2</sub>. The contact between Tof<sub>b-2</sub> and Tof<sub>b-1</sub> trends subparallel to the slope contours between trenches T-17b and T-18.

## DIABLO CANYON ISFSI

### FIGURE D-21 TRENCH T-18 (CENTER OF PHOTO) VIEW TO SOUTHEAST

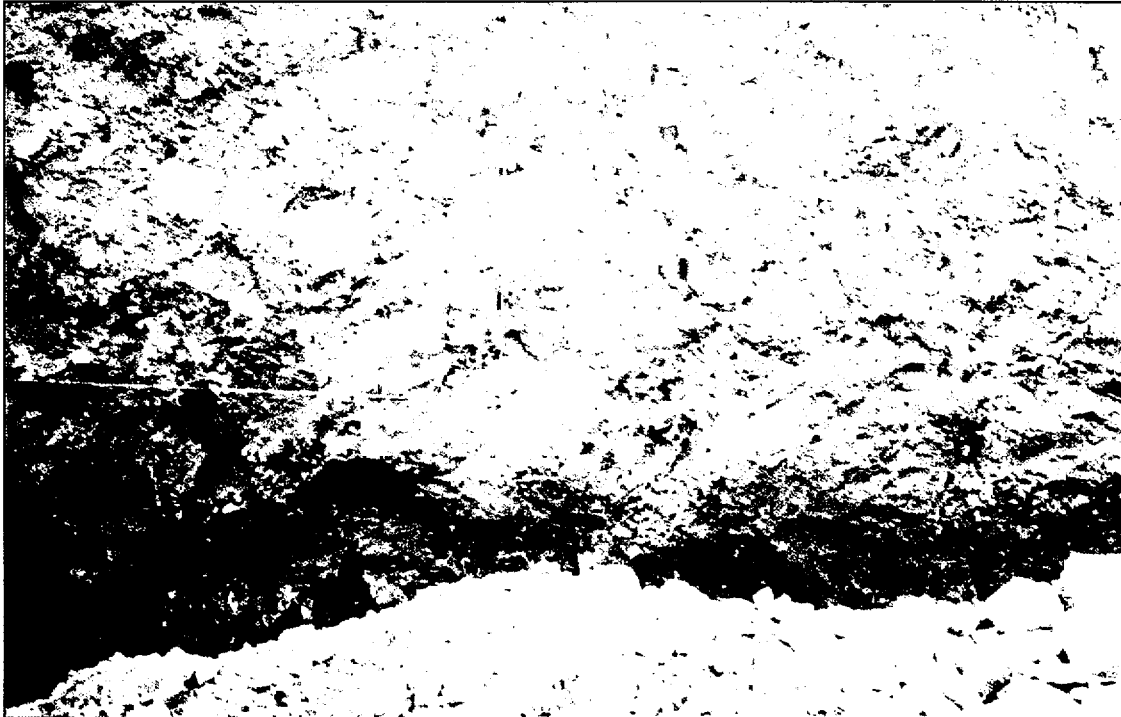


(Roll 00 JLB-3)

Blocky to massive dolomite in trench T-19.

## DIABLO CANYON ISFSI

### FIGURE D-22 TRENCH T-19, VIEW TO NORTHWEST

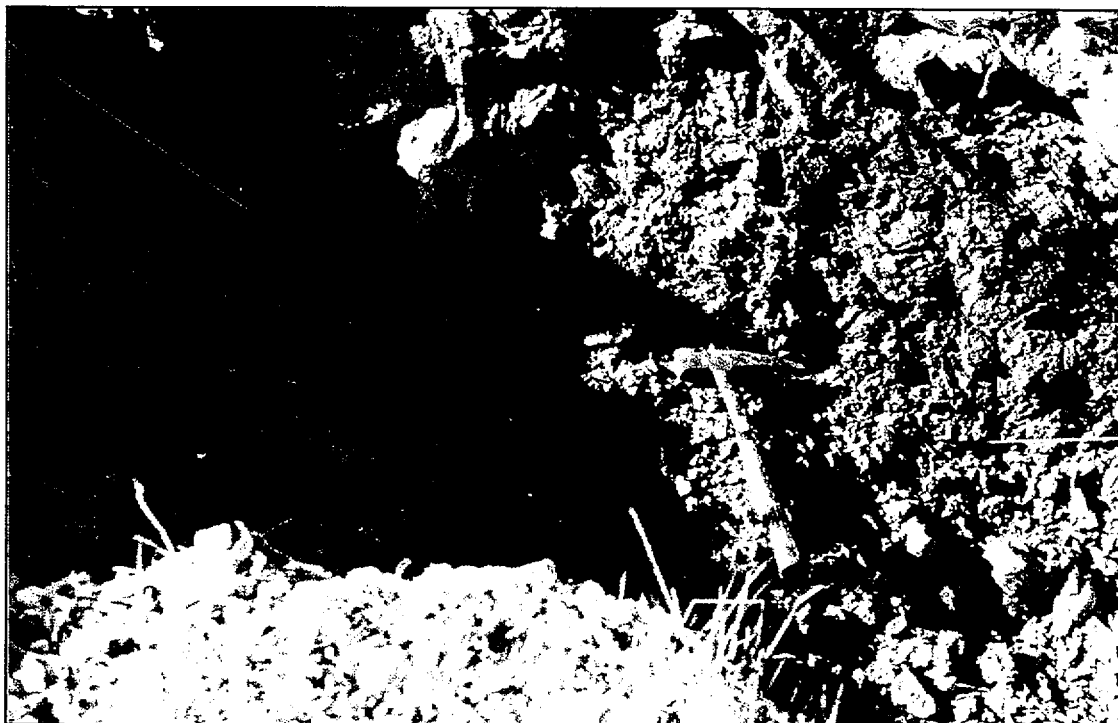


(Roll 00 JGH-2)

Altered dolomite (Tof<sub>b-1a</sub>) in trench T-20A. This rock has a block-in-matrix composition, with harder blocks of limestone and dolomite in a silty matrix. No bedding or joints are evident. A fault contact with unaltered dolomite (Tof<sub>b-1</sub>) is on the right.

## DIABLO CANYON ISFSI

### FIGURE D-23 TRENCH T-20A, SOUTH WALL



(Roll 00 AK-1)

Weathered petroliferous shale (dark rock at hammer) in fault contact with dolomite (Tof<sub>b</sub>-1) (light rock on right side of photo), in trench T-21.

## DIABLO CANYON ISFSI

**FIGURE D-24**  
**TRENCH T-21A, VIEW TO SOUTHWEST**



(Roll JLB 2000)

Dolomite in trench T-22.

## DIABLO CANYON ISFSI

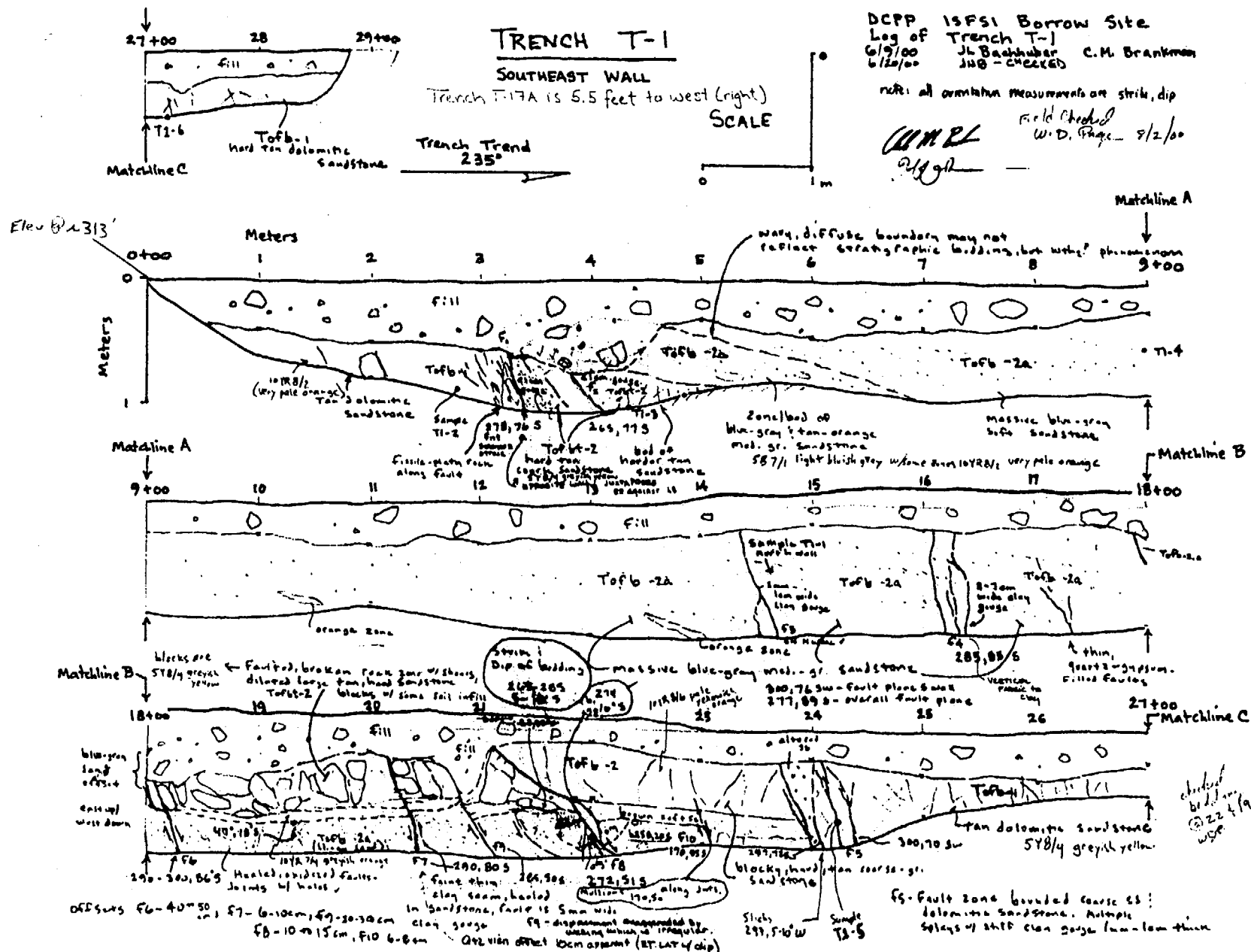
### FIGURE D-25 TRENCH T-22

**ATTACHMENT 1**

**DATA REPORT D**

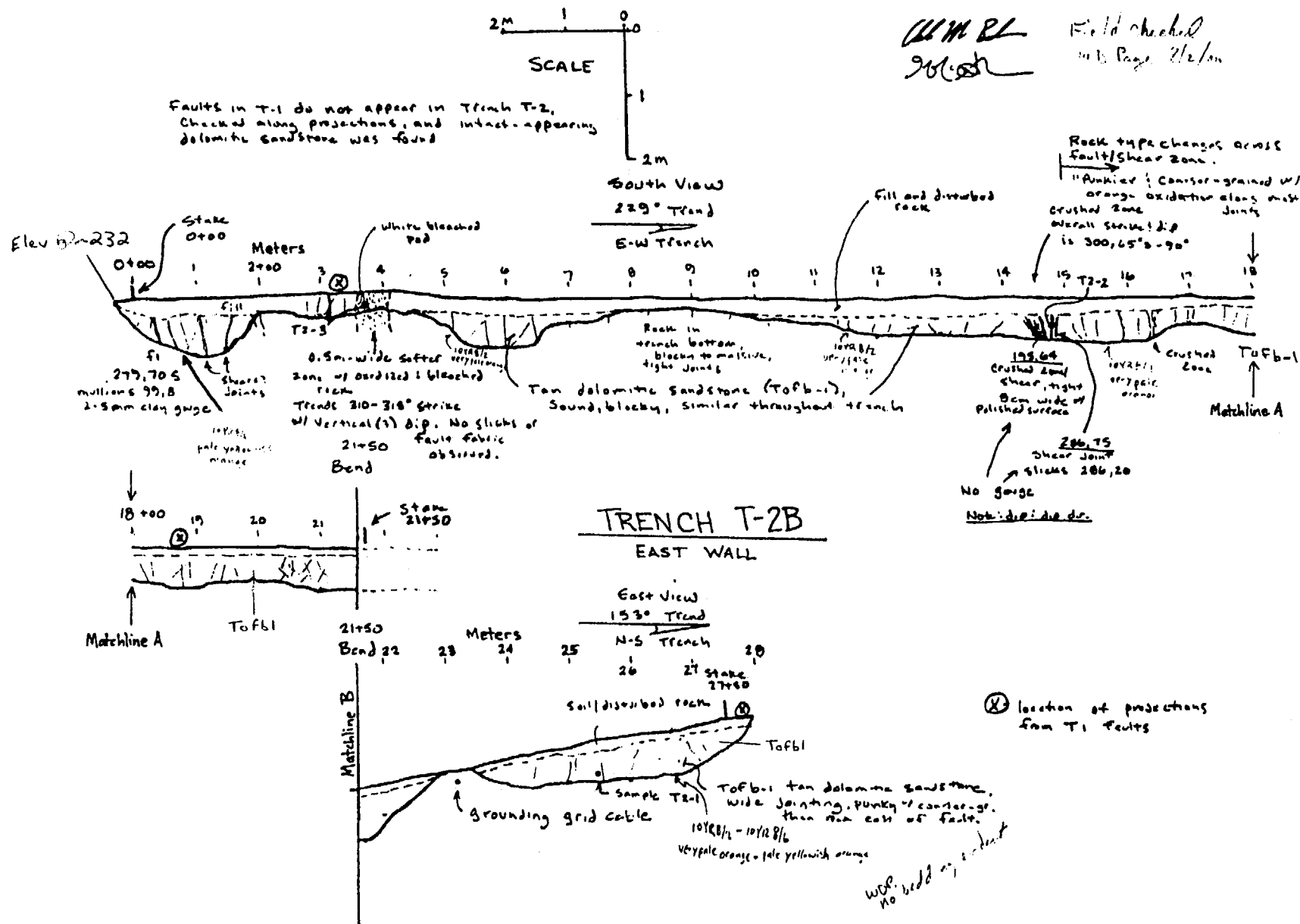
**FIELD TRENCH LOGS**

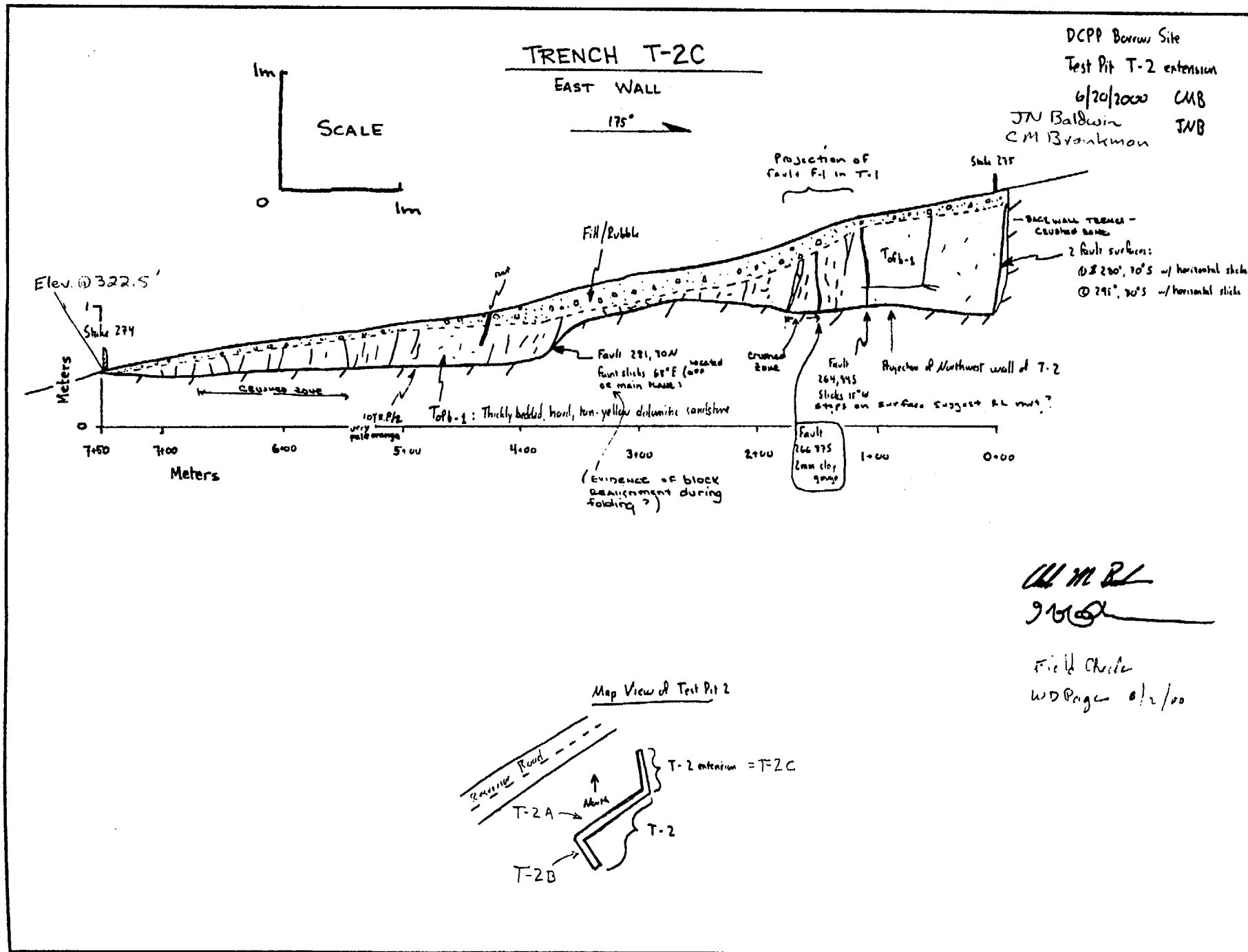




DCPP ISFSI Borrow Site Study  
June 11, 2000 JLB, CMB  
JL Bachhuber, CM Brunkman  
Test Trench ISFSIT-2

UW RL  
J.M. [Signature]



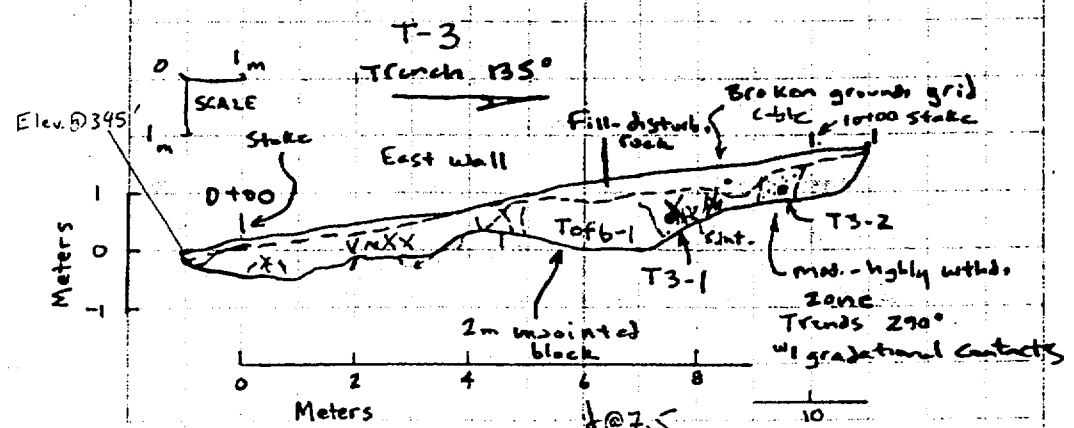


DCPP Borras Site  
 Test Pit T-3  
 6/11/00  
 JL Bochkhuber  
 CM Brankman

Note: Trench numbering corresponds to  
 sequence of logging. Do not match prelim.  
 trench location maps.

Trench ISFSI T-3 NORTHEAST WALL

Dolomitic Sandstone unit Tafb-1 exposed  
 throughout trench. Rock is typically hard, sil. with.  
 with some localized softer, more weathered (mod.-high)  
 zones:



shallow pit @ 7.5  
 check:  
 N65W WDP  
 55-75 SW  
 mult. in 18° SE

Table 7.00 } cores 5 dk WDP.  
 7.50 } 7/10/00

Bedding? N60W, 24 SW WDP w/ Bochkhuber  
 dip direct 214 NO

*[Signature]*

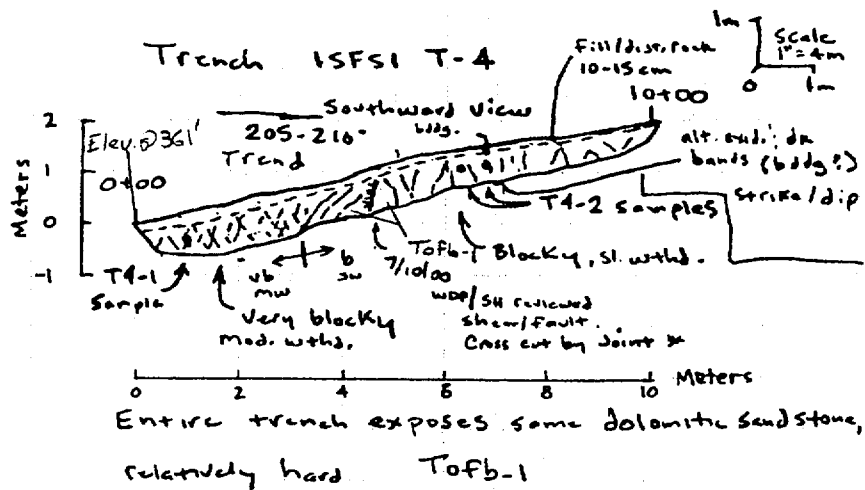
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DCPP Borrow Site  
Test Pit T-3  
6/11/00

JL Bachhuber  
CM Brunkman

TRENCH T-4

SOUTHEAST WALL



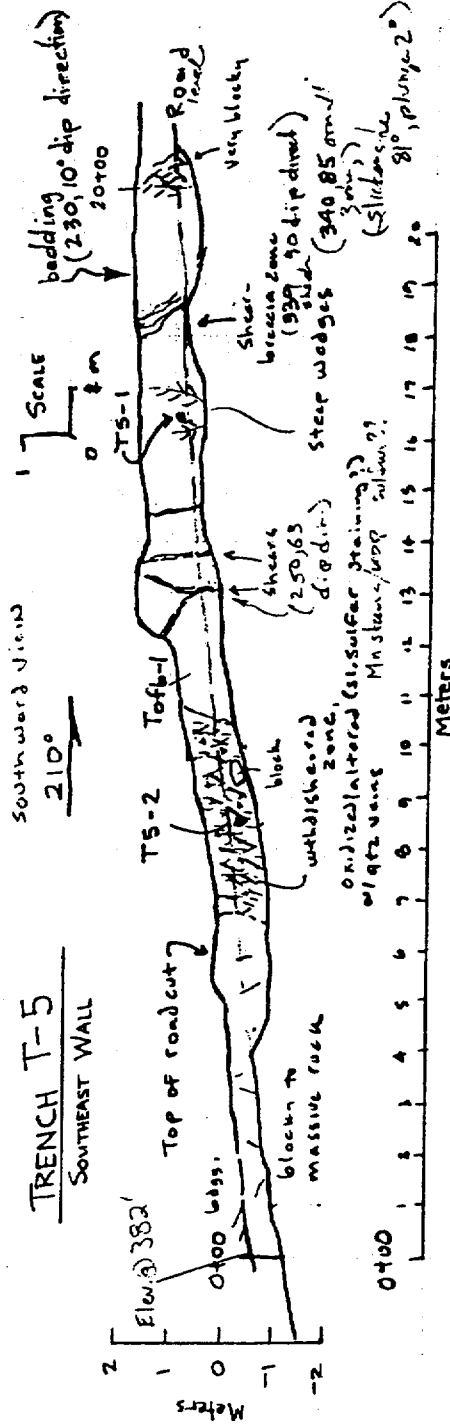
Bedding E-W 270, 6' St. 6+80

$\text{MB} \rightarrow \begin{matrix} \uparrow & \uparrow \\ \text{dipaz.} & \text{dp} \end{matrix}$

File 12 Check  
W.D. Page  
8/2/05

J. M. R. — Chas. M. R.

DCPP Borrow Site  
6/11/00  
JL Bachhuber  
CM Brankman

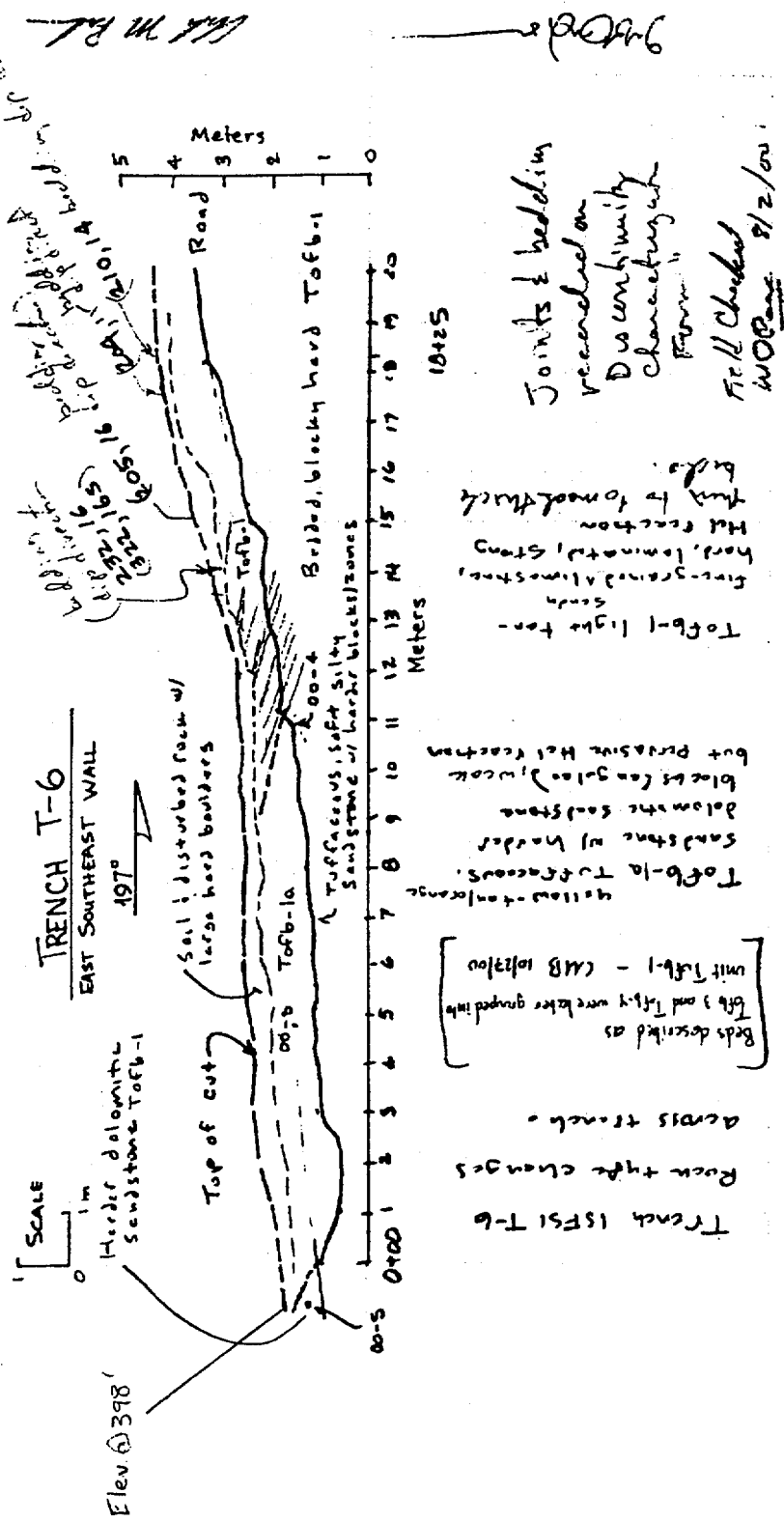


Trench 15FS1 T-5  
Tan dolomitic sandstone  
exposed throughout  
trench / road cut, (Tofb-1)  
Some zones of increased  
wtg. and faulting  
brecciation.  
Bedding laminations and  
surfaces.  
Bdg. is tightly-bounded  
w/ discontinuous beds plane  
Joints 0.25-0.5m long.  
Significant cohesion - bound  
along bedding surfaces

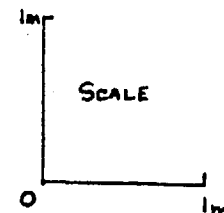
Attitudes of structures  
recorded and discontinuity  
Characterization Form

File checked  
WDP 8/2/00

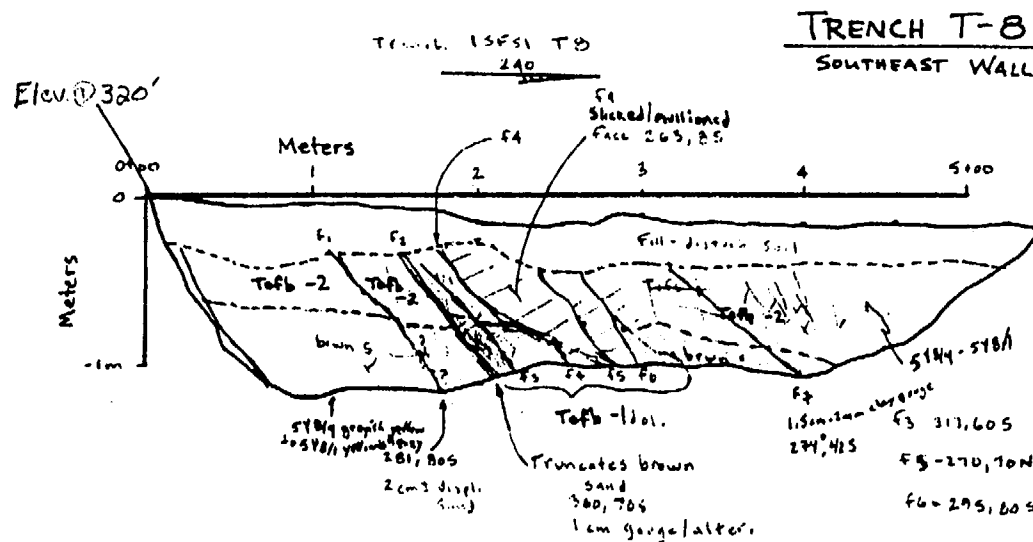
DCPT Borrow Site  
6/11/00  
JL Bachhuber  
CM Brunkman



TRENCH T-7  
SOUTHEAST WALL



UML  
96-  
Field checked  
WDPage 8/2/00





DCPD ISPSI Borrow Site

Trenches ISPSI T-9, T-16

6/15/00 JLB/CMB JL Bachhuber

Field checked 8/2/00 CM Brankman

W.D. Page

Trench ISPSI T-9

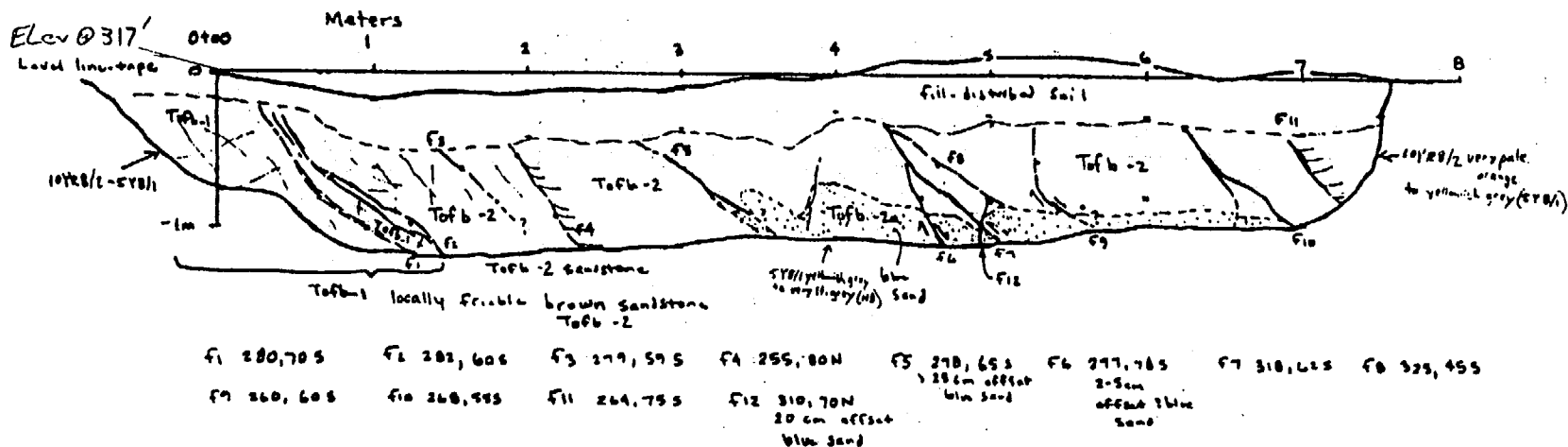
# TRENCH T-9

SOUTH WALL

South View

220

T-9

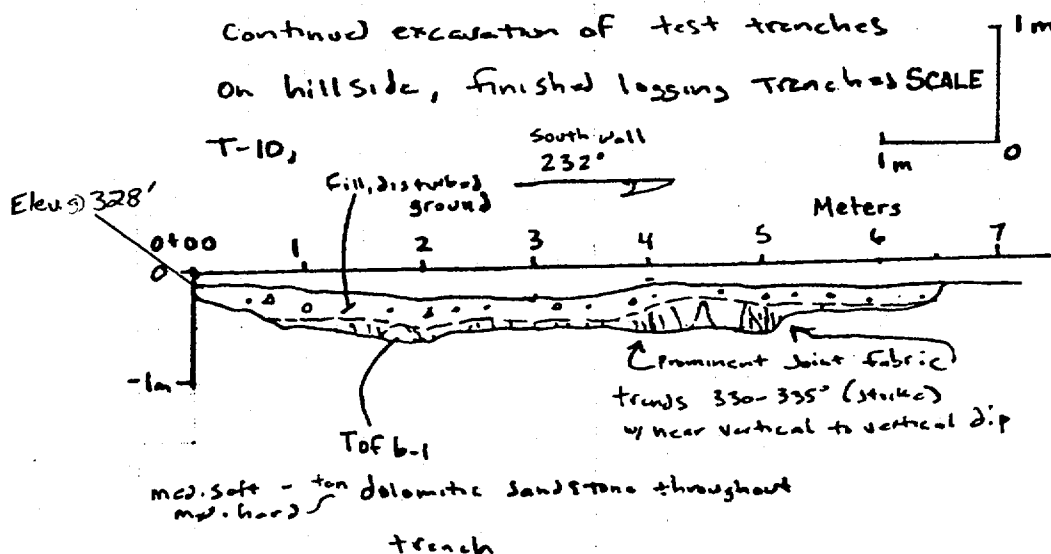


T-16 blanked out

TRENCH T-10  
 SOUTH WALL  
 JH Bachhuber  
 CM Brunkman  
 6/14/00 JLB CMB

F.P. 1/1 checked  
 W.S. Page  
 8/2/00

Continued excavation of test trenches  
 on hillside, finished logging Trenches



Bedrock exposed continuously across trench  
 floor. Rock mass is tight w/ close to widely  
 spaced joints (blocky to very blocky).

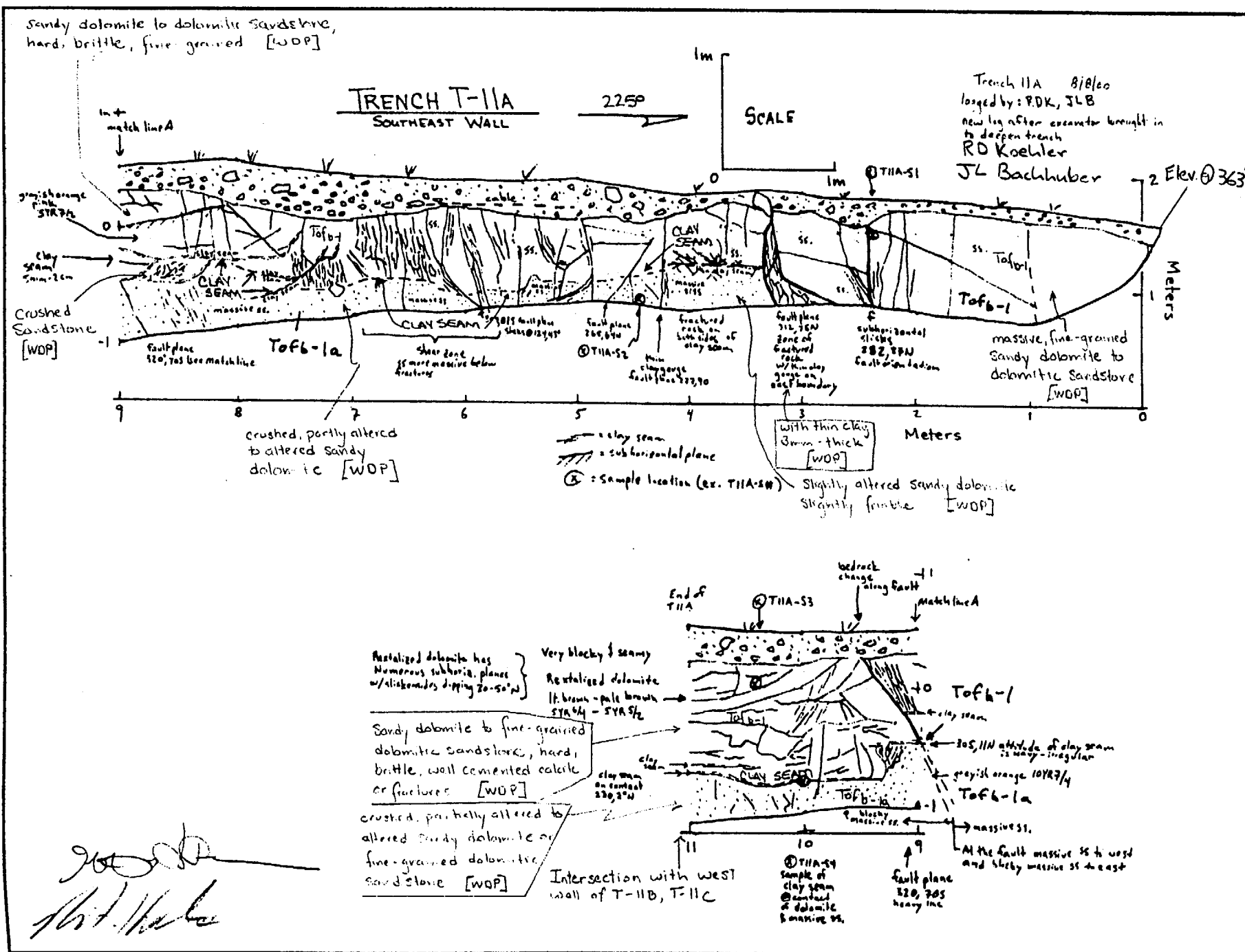
Some slight slickensides and manganese on  
 tight joint surfaces, but no gouge or crushed zones.

Mapping along Reservoir Road

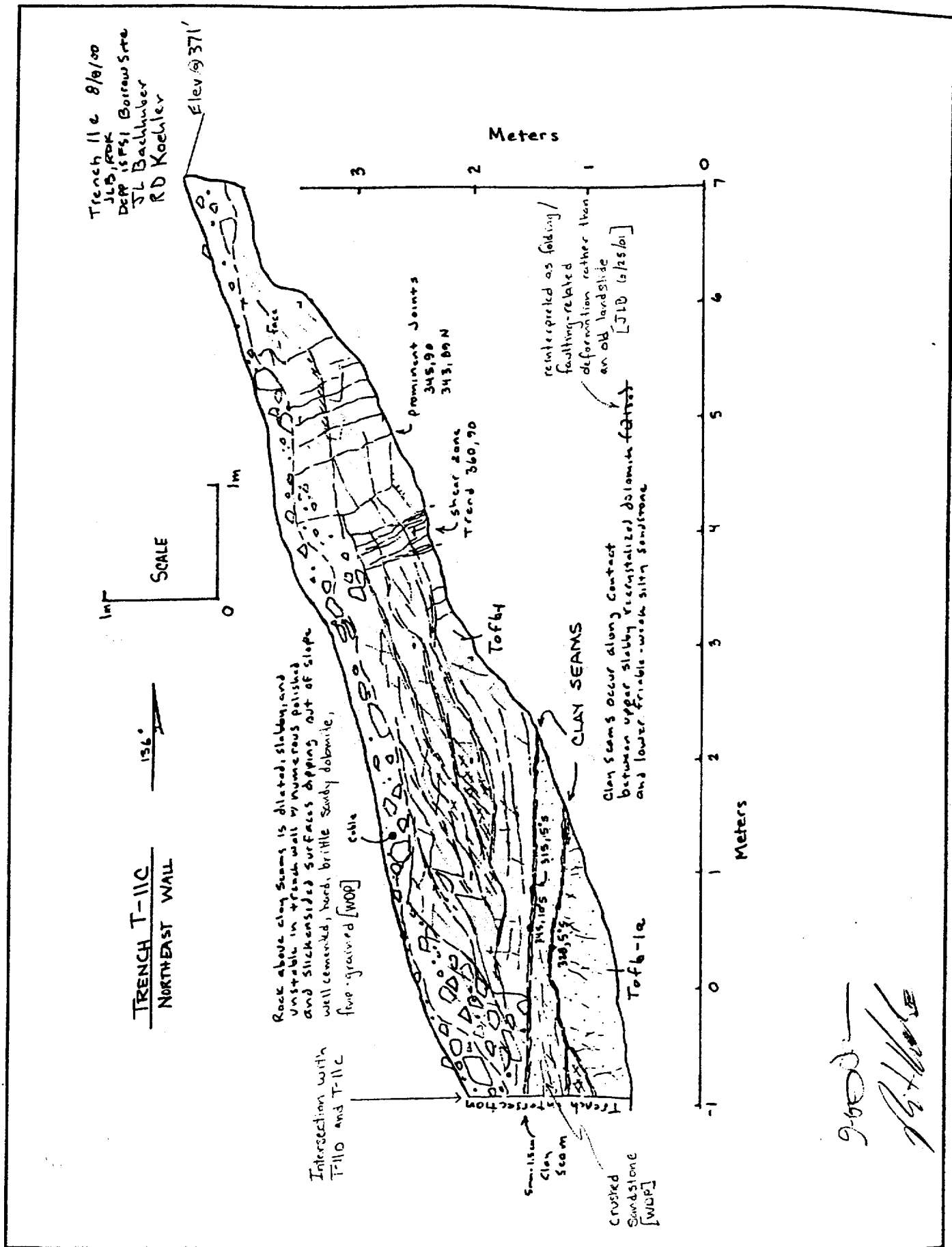
00-T5 OBS, SON Bedding in med. to thick bedded,  
 hard dolomitic sandstone unit ToF b-1. High level  
 of confidence

9-10-00

John M. Bach







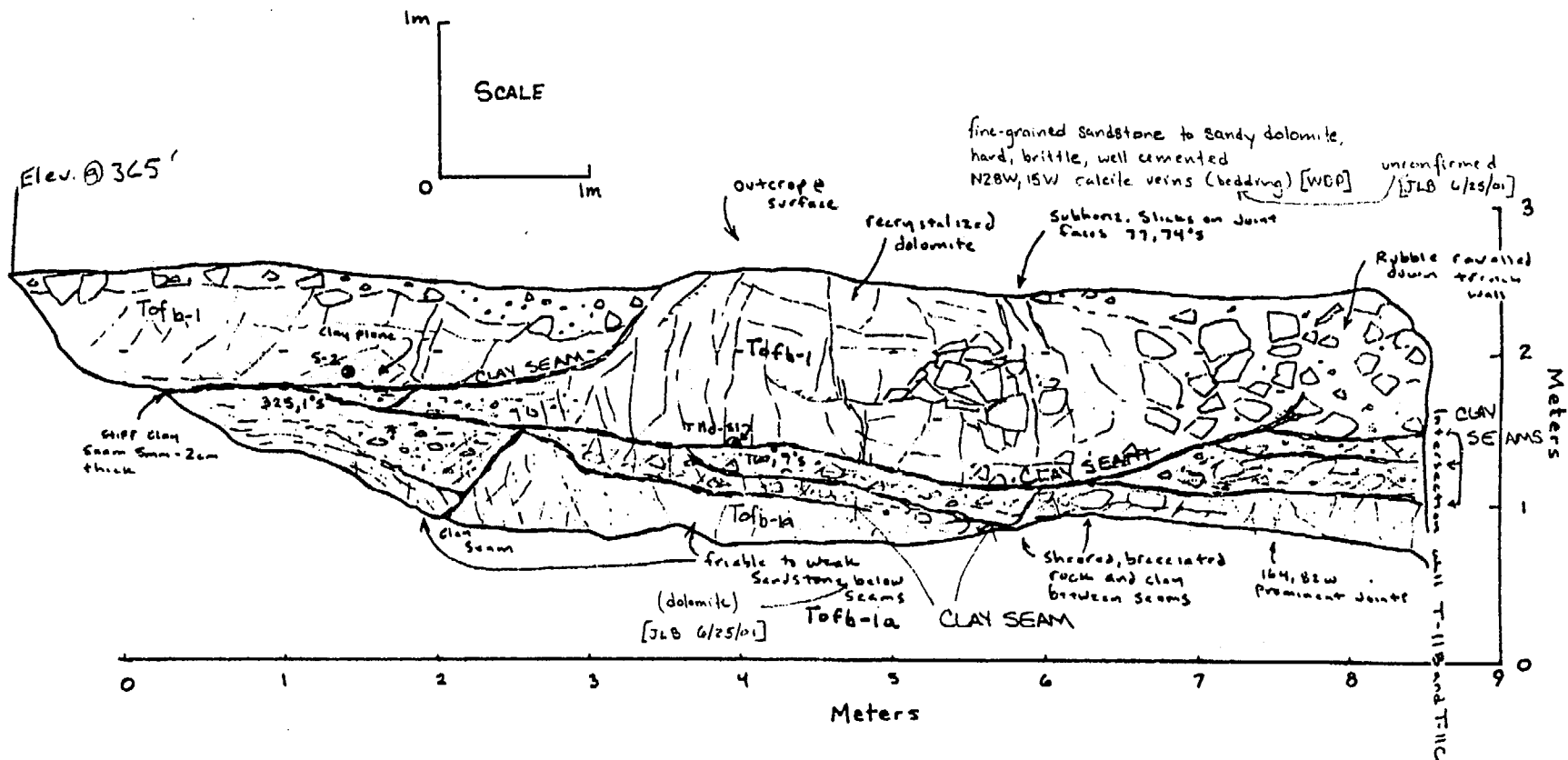
Good  
JLB

# TRENCH T-11D

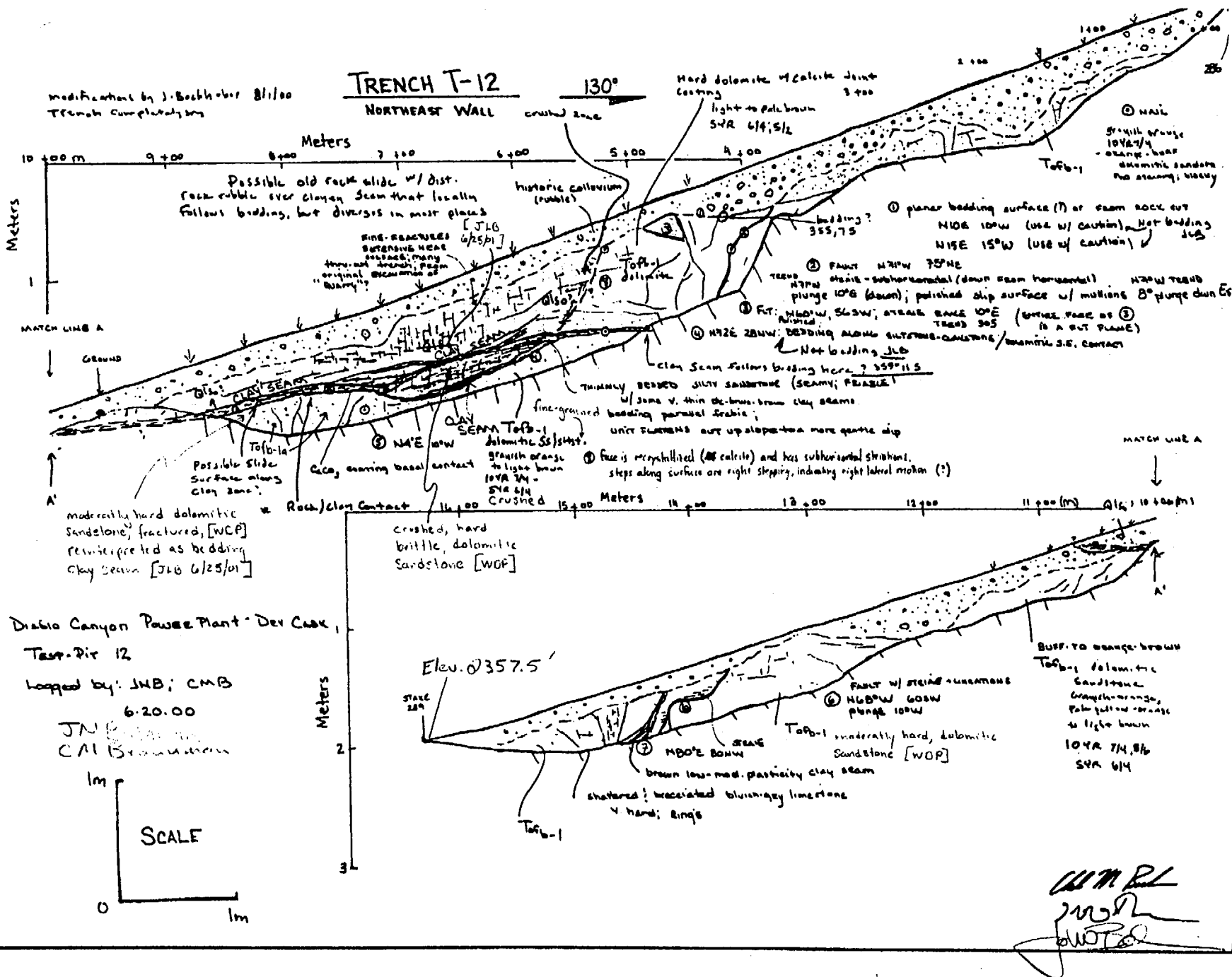
SOUTHEAST WALL

215°

Trench 11d 8/8/00  
DCPP ISFSI  
JLB, ROK  
JL Bachhuber  
RD Koehler



JLB  
RD Koehler



DCPP ISFSI Borrow Site

Test Pit T-13

6/20/2000

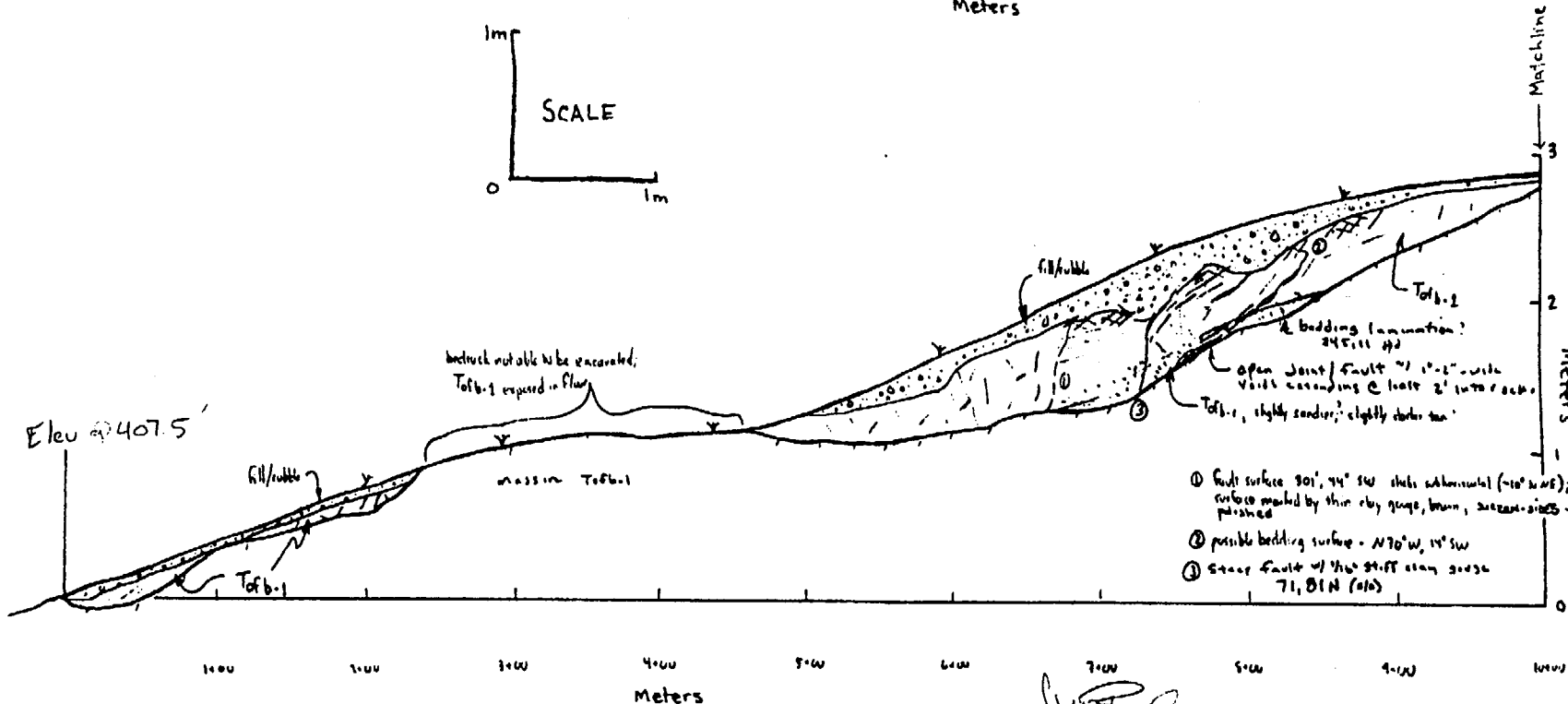
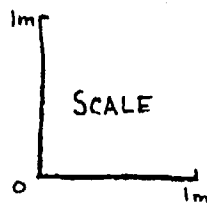
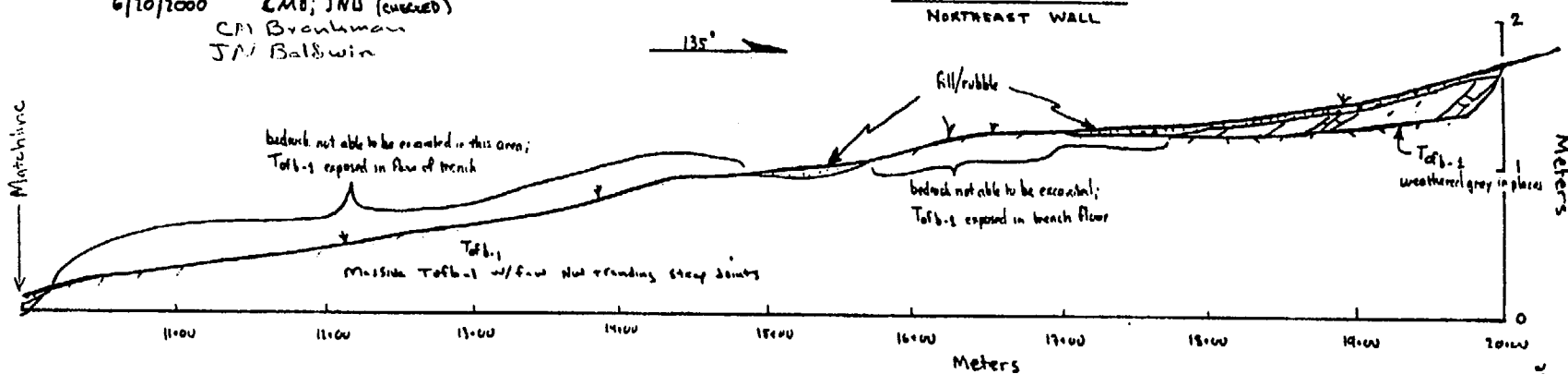
LMB; JNB (checked)

CPA Brunkman

JM Baldwin

# TRENCH T-13

NORTHEAST WALL

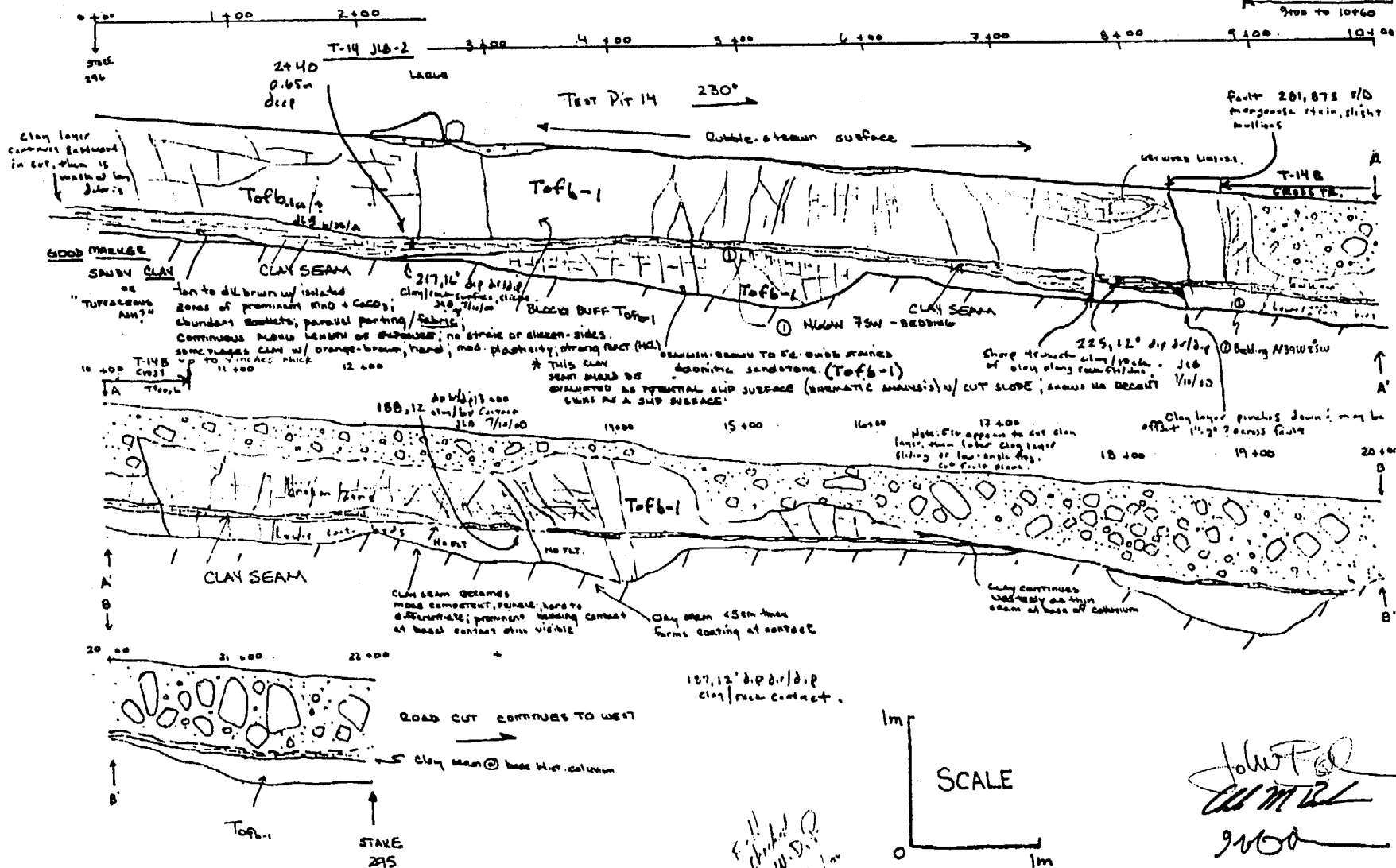


*[Handwritten signature]*  
JMB



TRENCH T-14A

K T-14 B  
APR 19 1960

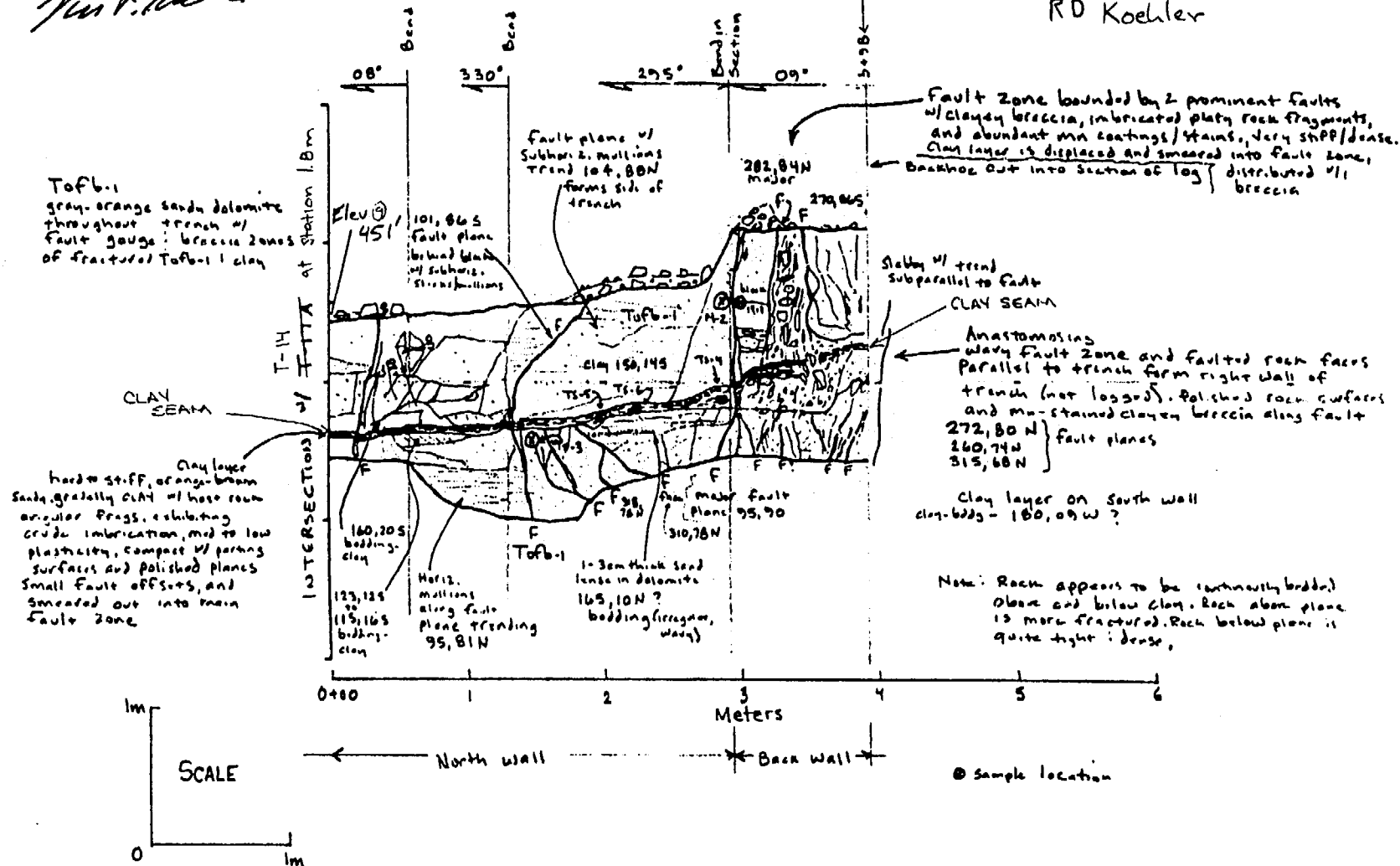


9/10/00  
Neil T. Maher

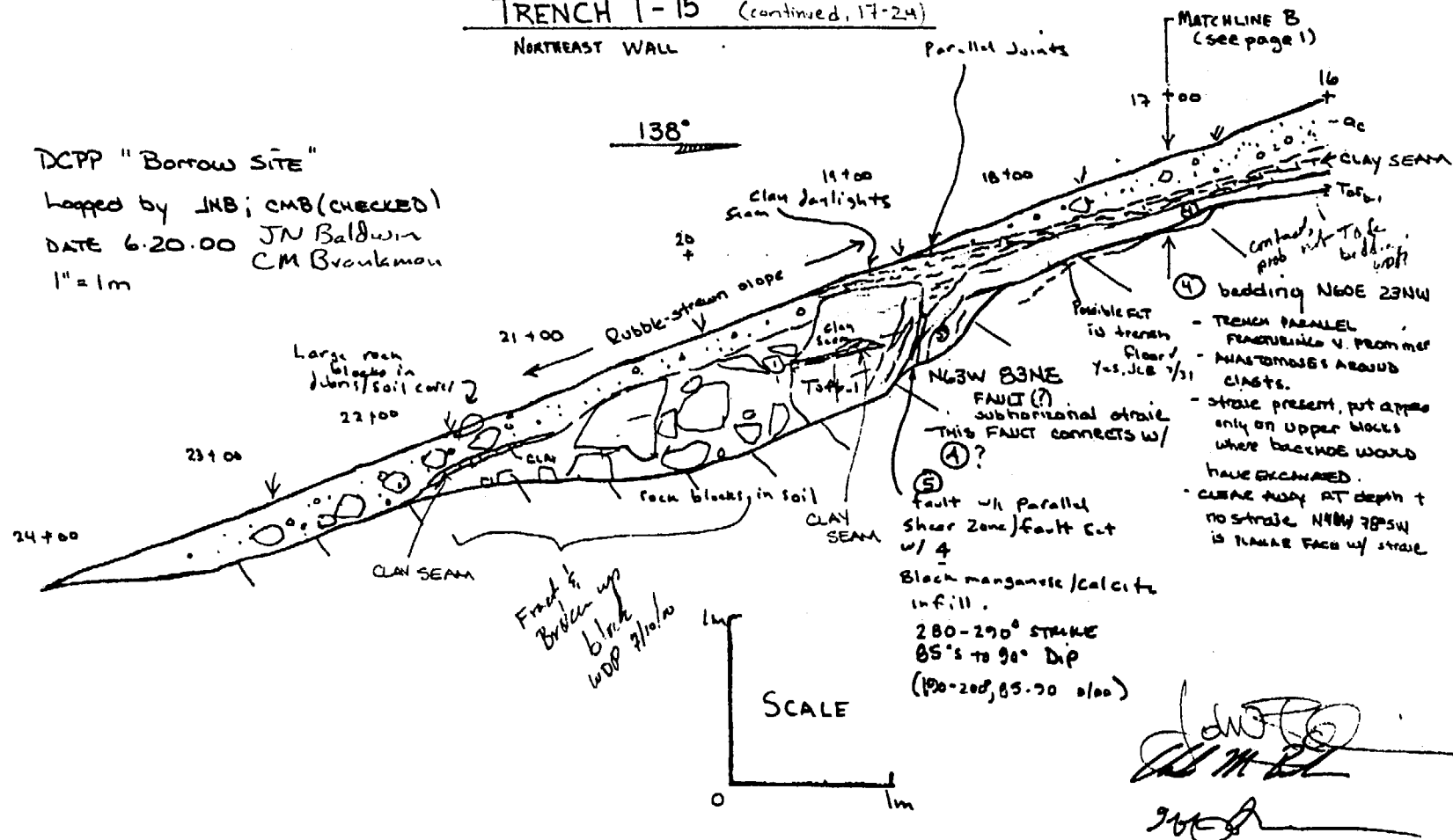
Intersection of T-14A  
at Station  
2.5m

# TRENCH T-14B NORTH WALL

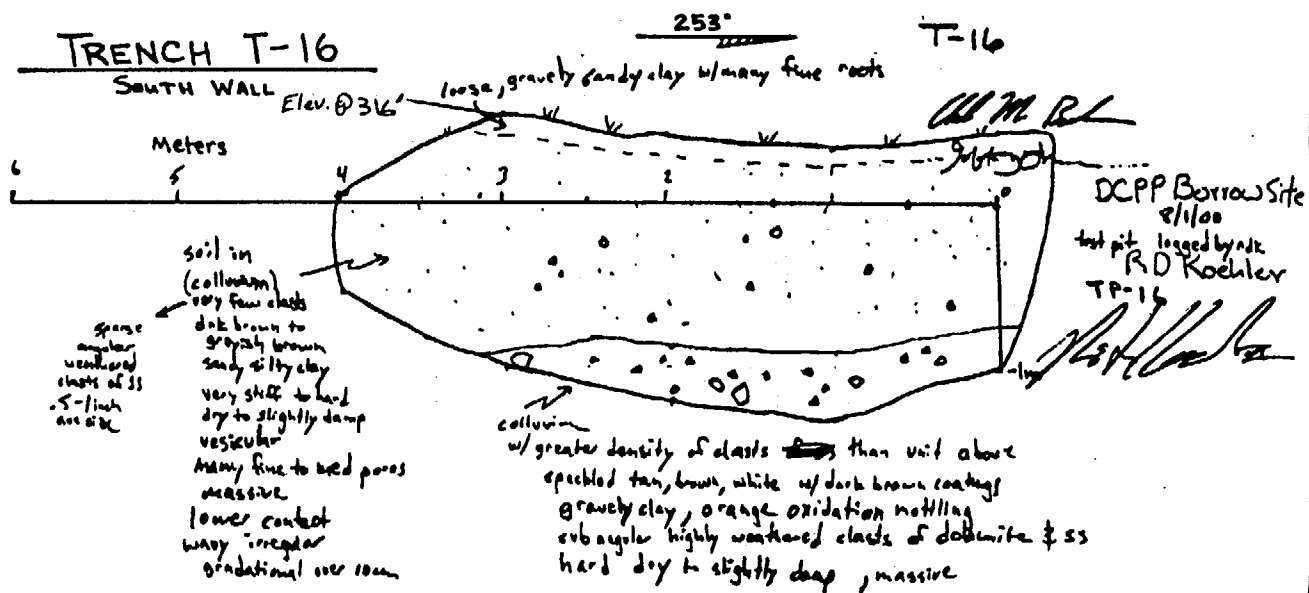
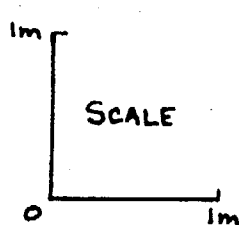
DCPP ISFSI Barrow Site:  
Trench T-14B  
JLB/ROK 8/7/00  
JL Bachhuber  
RD Koehler

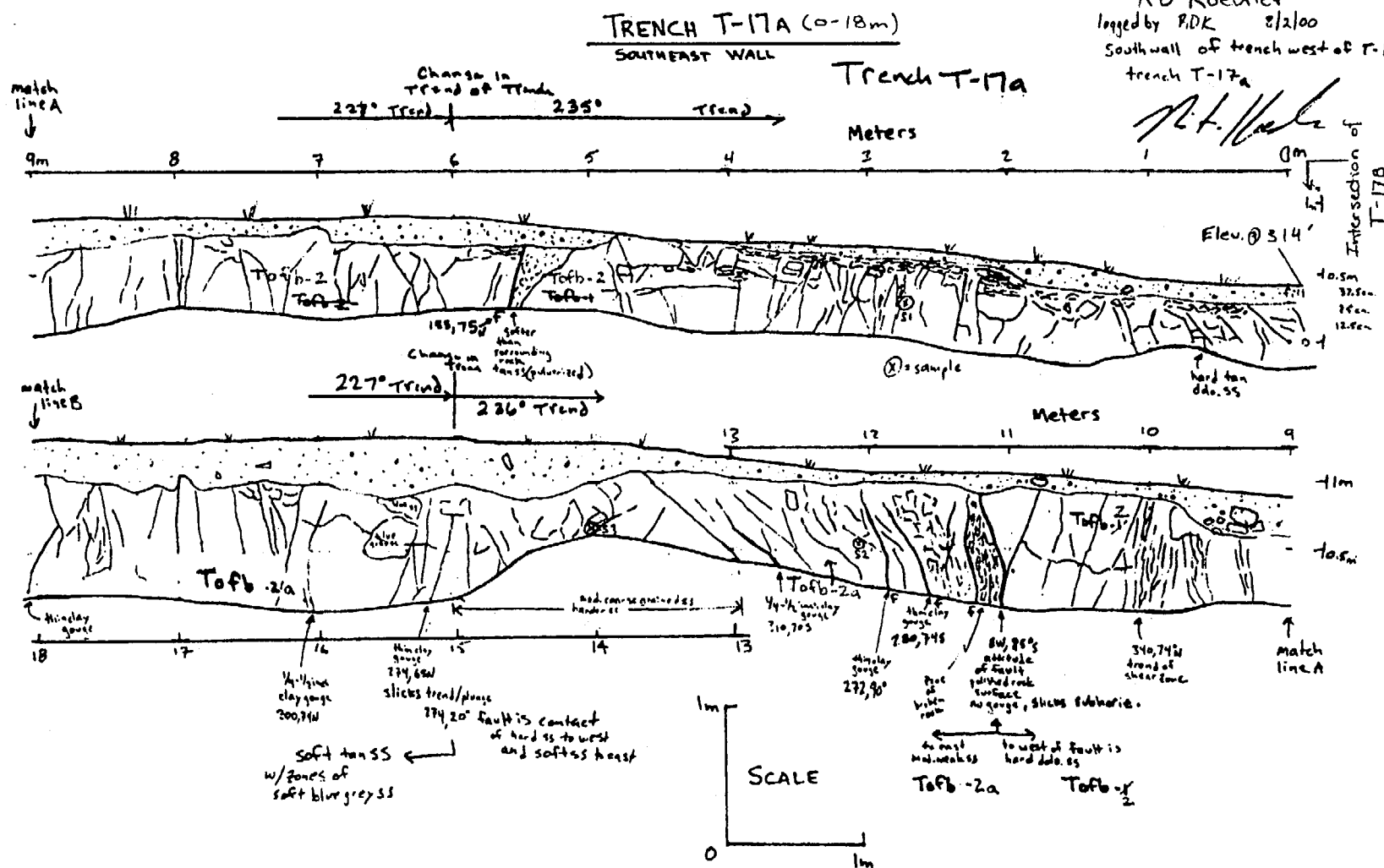






T-9 blanked out





Revisions to UNITE JCB 9/9/01

RDK  
logged by JLB 8/2/00  
South wall Trench west of T-1  
Trench T-17a

### SOUTHEAST WALL

(continued, 148-36m)

227°



SCALE

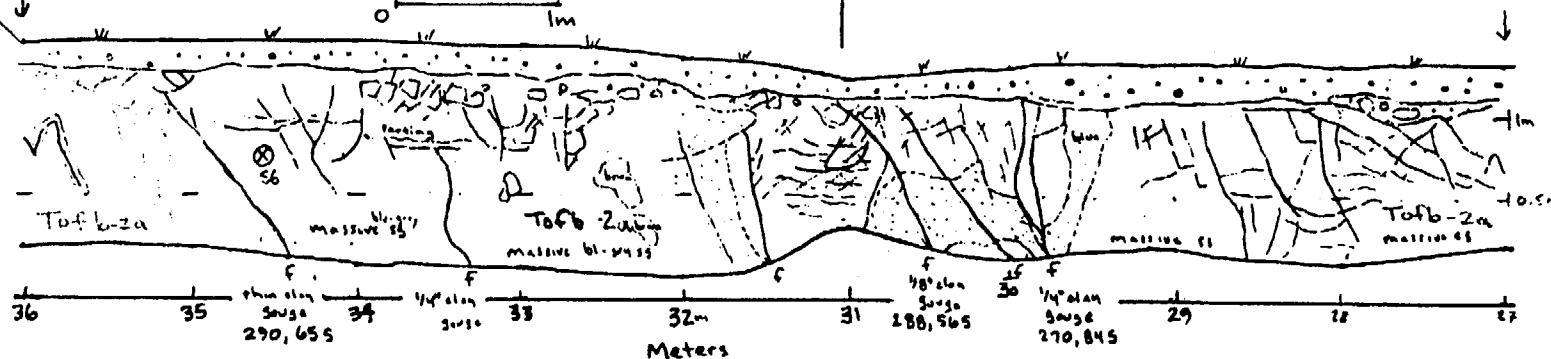
## Change in Trench Trend

237•

227.

Elev @ 310' match lined

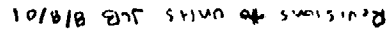
mate  
line



Revisions to units JLB 8/8/01

TRENCH T-17A (continued, 36-45m)  
SOUTHEAST WALL  
Trench T-1 is 5.5 feet to east (left)  
8/12/00

TRENCH T-17A (continued, 36-45m) SOUTHEAST WALL

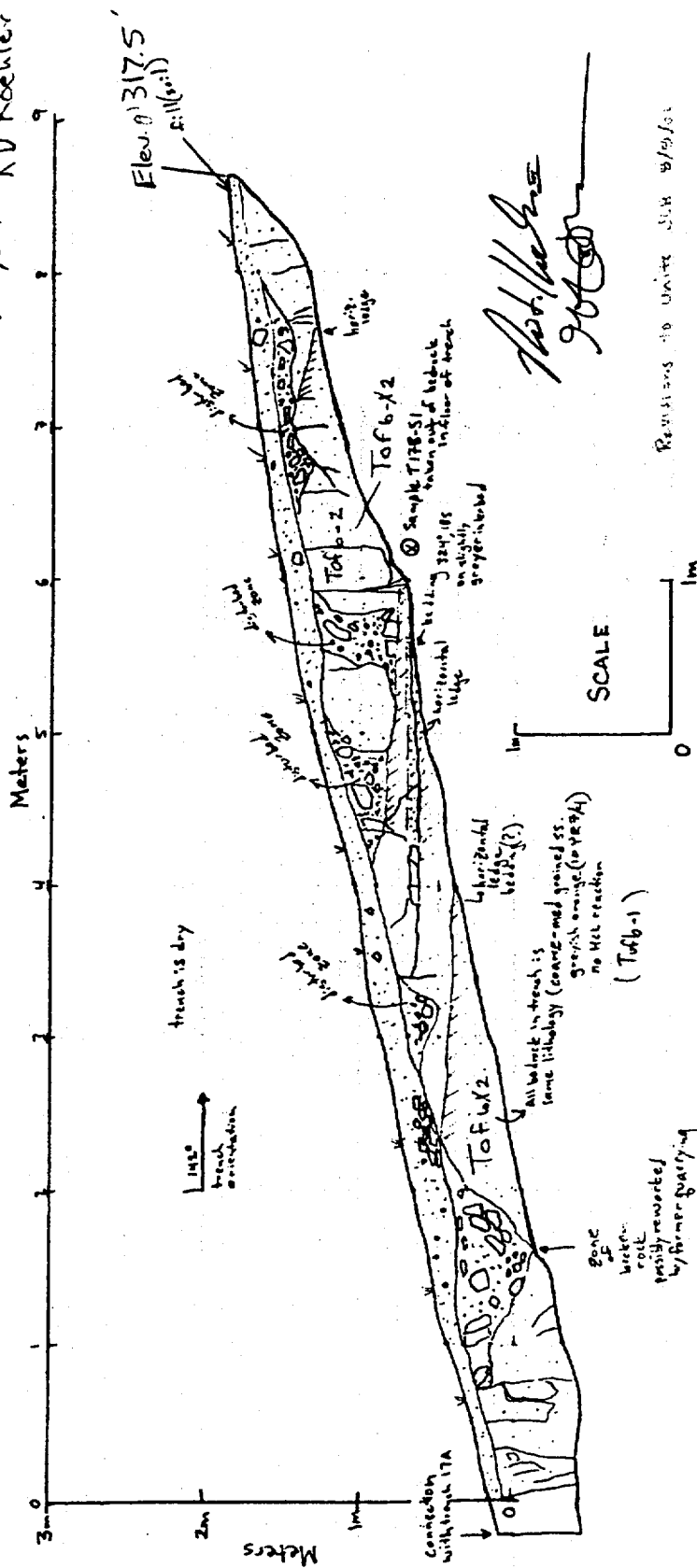


D-56 of 66



**TRENCH T-17B**  
NORTHEAST WALL

2/7/00 logged by RDK, JLB  
Trench 17B JL Bachhuber  
PGE DyCast RD Koehler



Revisions to Unit 17B 9/29/00



DXAP 15FS1 Borrow Site  
Recon Mass Characterization  
Trench T-18b  
8/3/00  
R. Koehler, J. Bachhuber

TRENCH F-18B  
SOUTHEAST WALL

220: Trend

981-46

Soil and rock debris

Elev @ 355'

SCALE

三

Shear zone  
w/ oxidized, crushed,  
slabby rock  
Trend is 340°, 70 to  
350°, 86 S

Shore of  
clay-lined  
ditches  
325, 769J

1-9501

11 -

1-3-1

三

1

五

711

Same rock throughout Tenah  
Tafel dolomite - clastic (sed.) dolomite  
Sl. - med. weathered, medium strong  
Blocky w/ lobbly; Crusted seams and shor  
teach (subv.)

Trench is dry

Intersection with  
Trench T-18A

F. Faults 19  
S/S shear-joint -

Meters

JH 12/1/00 Scale 1"=1m  
PG+E - DCP, Dry Cast Phase II

DCPP-ISFSI Borrow Site

Logged by:

JG Helms

Field Review J. Bachhuber 12/1/00 Revisions to units JLB 8/8/01

South

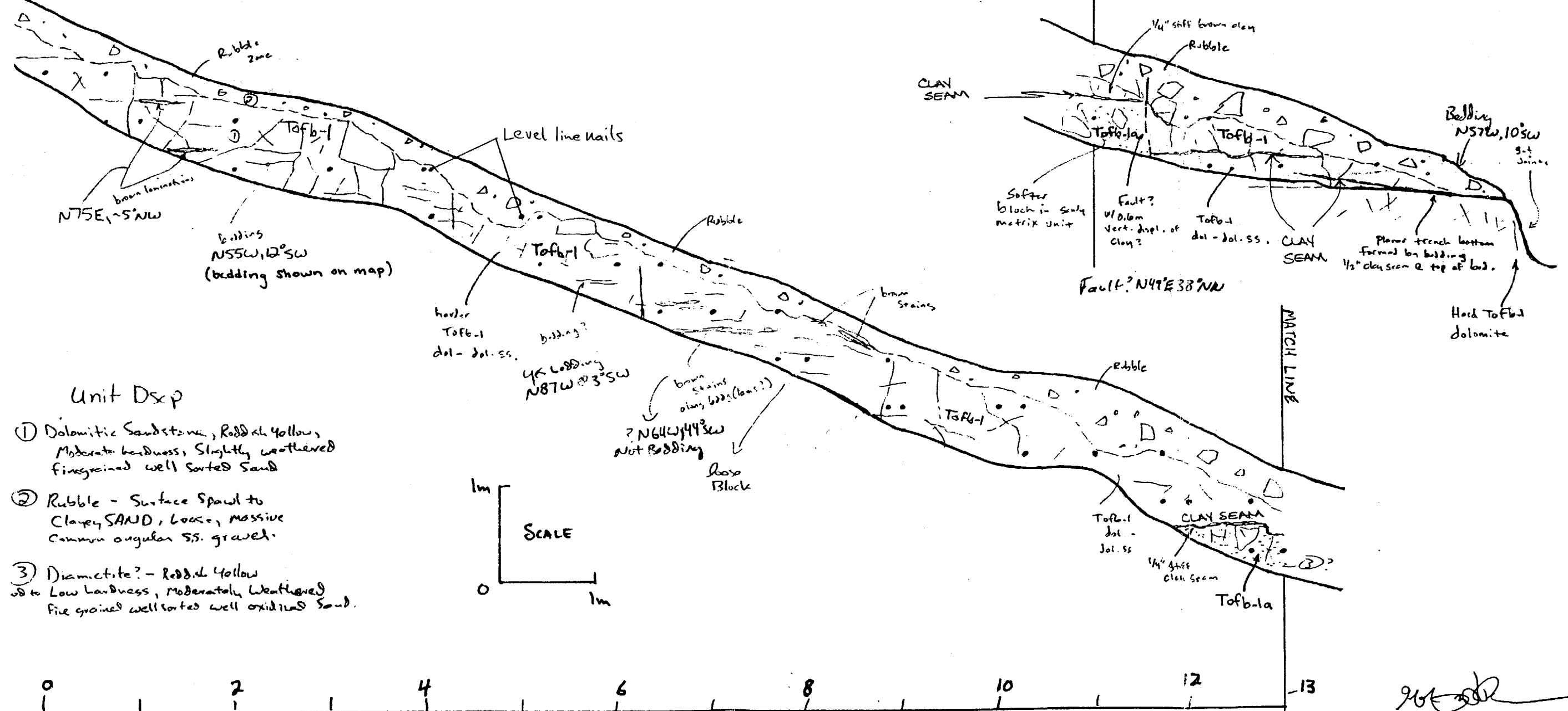
North

# TRENCH T-19 (Slope) SOUTHWEST WALL

315°

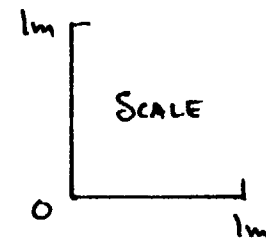
13 14 15 16

Elev @ 477'



## Unit Dexp

- ① Dolomitic Sandstone, Reddish yellow, Moderate hardness, Slightly weathered fine grained well sorted Sand
- ② Rubble - Surface Spawl to Clayey SAND, Loose, massive common angular ss. gravel.
- ③ Diamicite? - Reddish yellow to Low hardness, Moderately weathered fine grained well sorted well oxidized Sand.



Meters

*JG Helms*

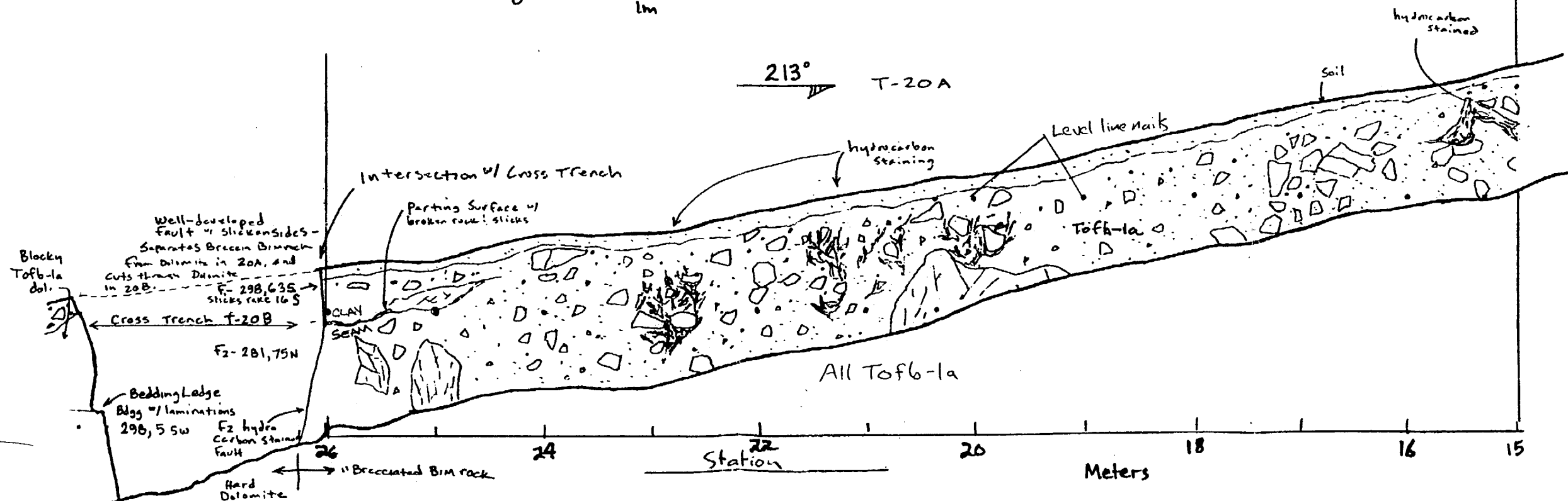
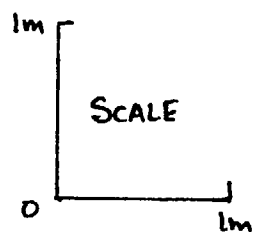
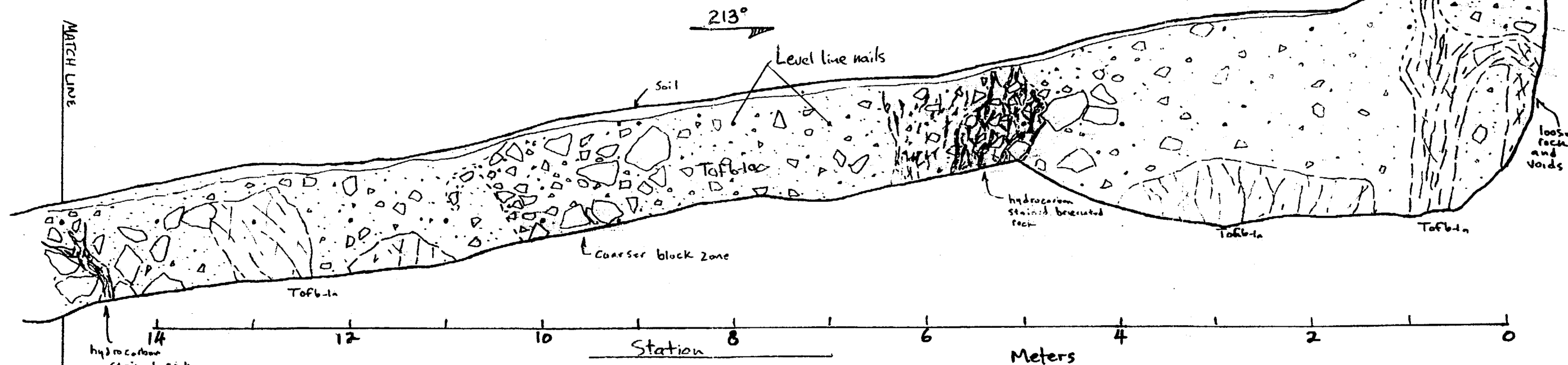
DCPP-ISFSI Borrow Site  
 Logged by:  
 JG Helms  
 JZ Bachhuber

JH 11/30/00 Scale 1"=1m  
 PG+E-DCPP-Dry Cast Phase II

**TRENCH T-20A**  
 SOUTHEAST WALL

West

Elev @ 370'

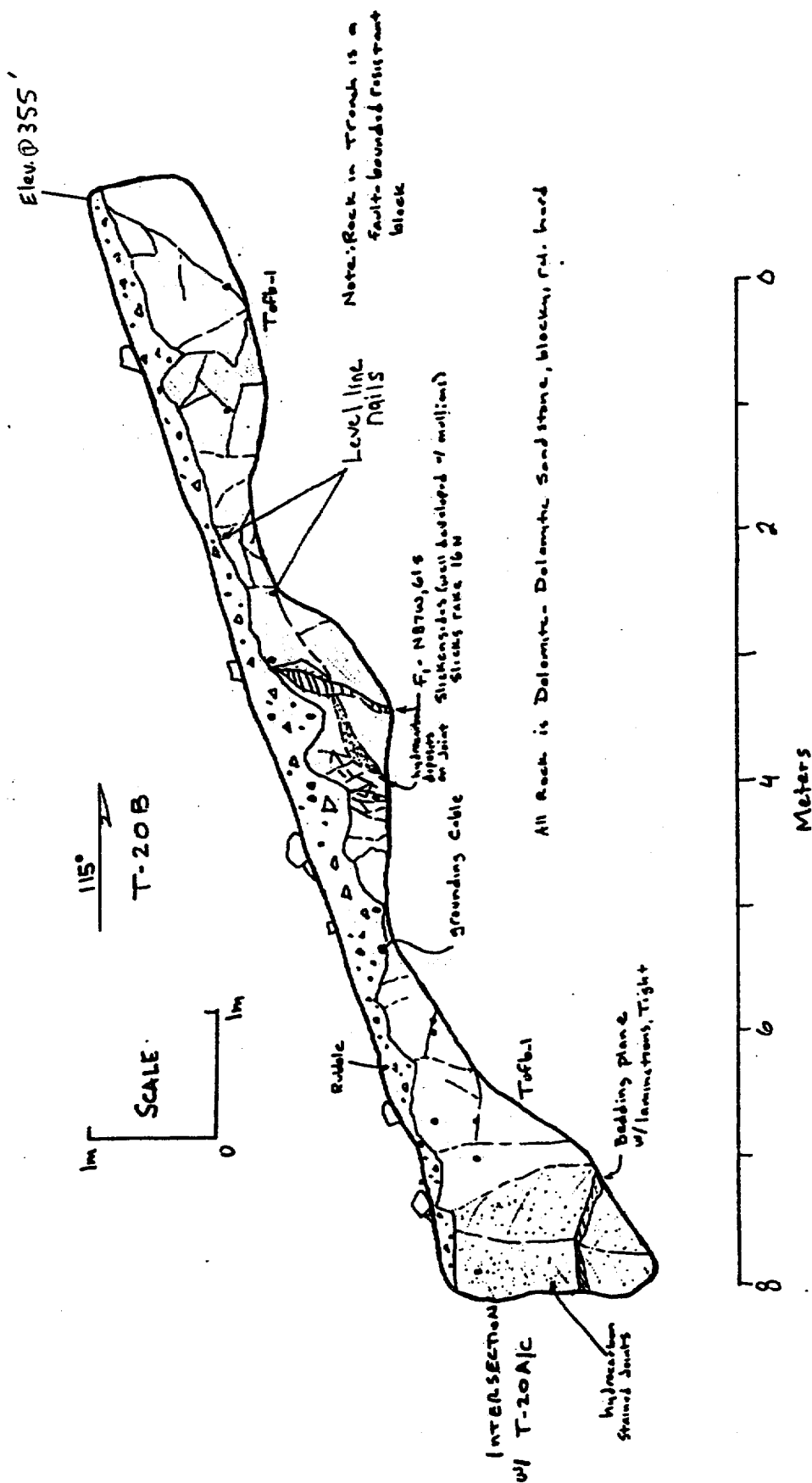


2002  
 JG Helms

# TRENCH T-20B Northeast Wall

Dry Creek Phase II  
T-20B

DOPP- ISFSI Borehole Site  
J.H. 12/5/00  
J. Baskinbur / J. Helms 12/6/00



*John H. Helms*  
*J. Baskinbur*

TRENCH T-20C

Southeast Wall

DCPP ISFSI BORROW AREA T20C

Logged by:  
J. Smith, J. Williams  
J. Williams  
J. Williams

Revisions to units JWB 8/10/01

Meters

TRENCH 20C

Meters

524 W 515 W

MATCH LINE

Rubble  
Soil

Hydrocarbon  
deposits on joint/fault  
joints: 280° 60N  
20, 60N-70

Prominent joint pattern along  
multinormed fault  
trend  
Hard ToFb-1  
dolomite blocks  
to massive

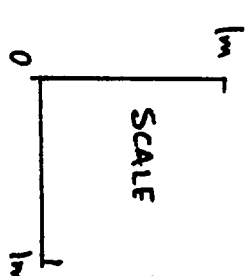
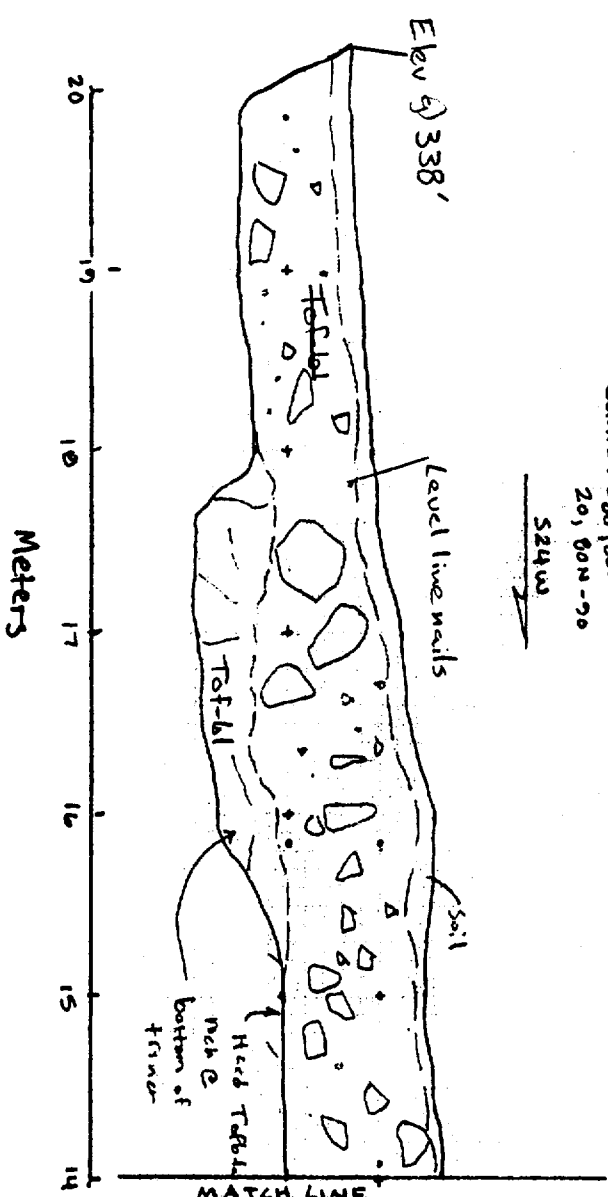
Contact is  
gradational and diffuse

Bin  
unit

Softer  
Bin zone  
Contact  
indistinct to gradational(?)  
CF2-NBCE, 765  
multinormed fault

hydrocarbon-coated  
multinormed fault  
FI-NBIE, 60N

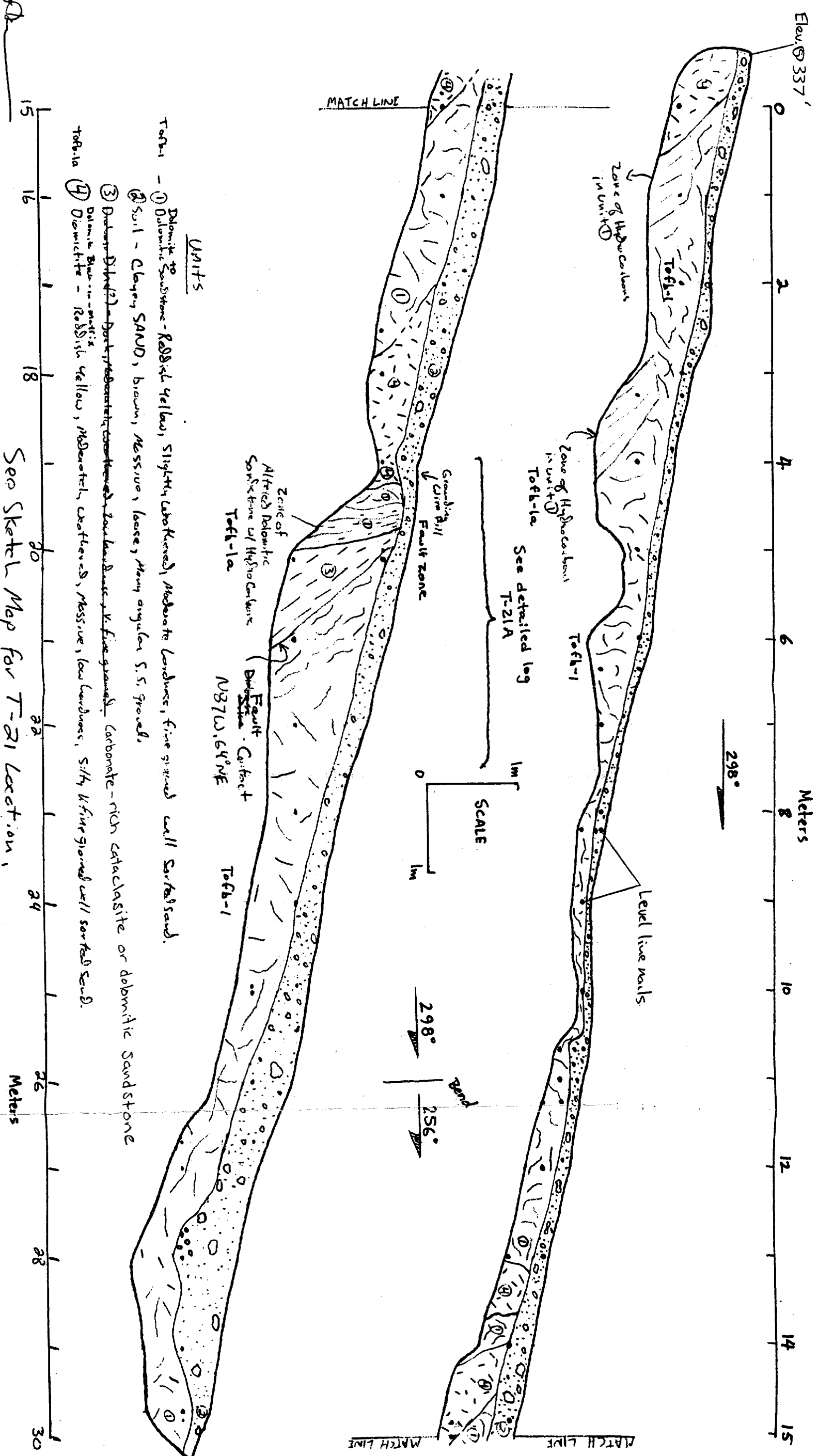
Cross Trench  
T-20B  
building  
plane



TRENCH T-21  
 Southwest Wall

Scale 1" = 1m

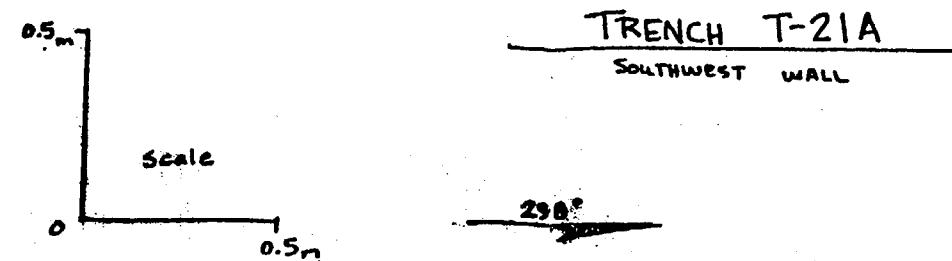
JCH  
 8/9 Dec. 2000  
 Field Review  
 J. Buchner 12/8-9/00



See Sketch Map for T-21 Location.



DCPP-ISFSI Borrow Site  
Trench 21A  
Detailed Log of Trench T-21 ISFSI Project  
4/16/01 J. Helms, C. Brankman, J. Bachhuber

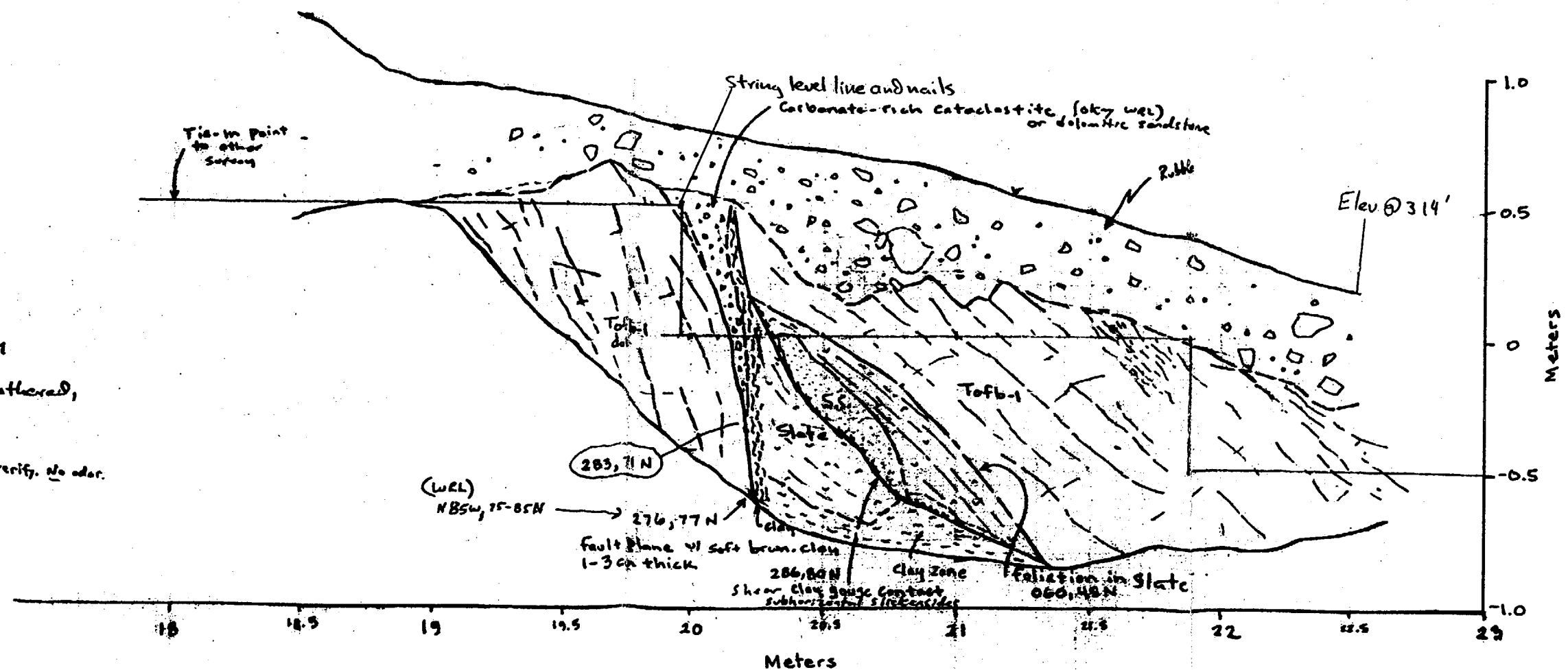


*[Handwritten signatures]*

OK WSP  
4/16/01  
OK 4/20/01  
WK fathi

Tofb-1 - dolomite, buff tan to tan orange, fine grained.

S.S. = SANDSTONE, greywacke, grey  
Medium grained, well-sorted,  
friable, massive, slightly weathered,  
Strength = R1., Petro rich(?).  
I could not verify. No odor.  
(WRL)



Logged by:  
JG Helms  
JL Bachhuber

H9C

4/22/01

Log of Travel at.

QA check  
4/28/11  
L.A. Jett

