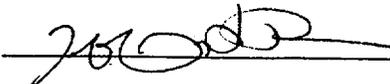
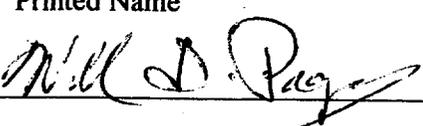
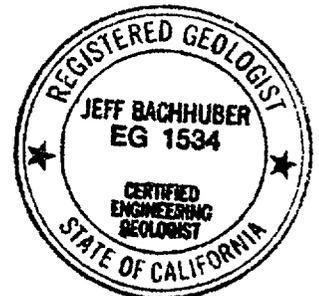


DATA REPORT D
TRENCHES IN THE ISFSI STUDY AREA
DIABLO CANYON ISFSI

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



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

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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 Tof₆ 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.

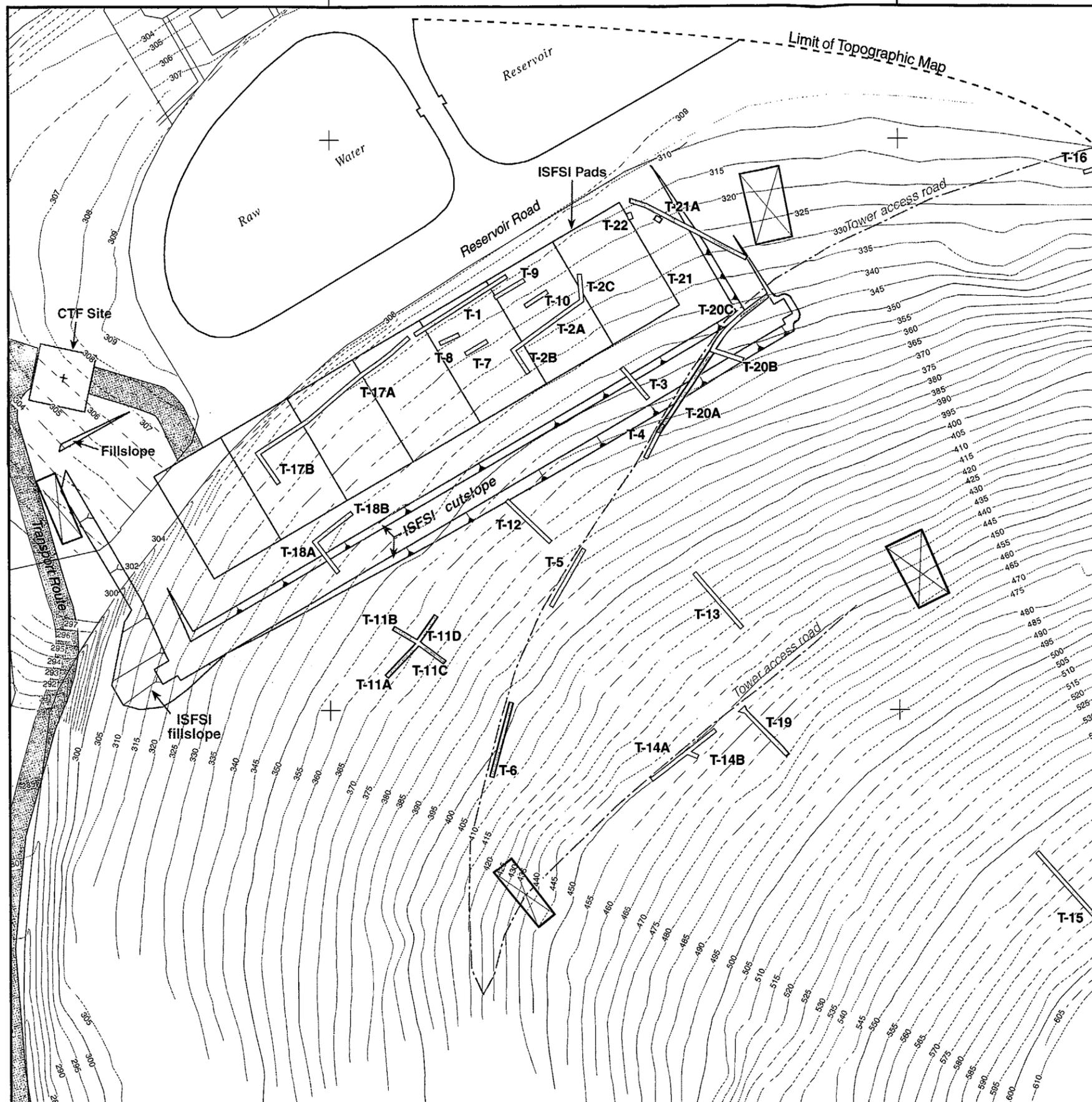
At the end of the study, the lithologic characteristics of the rocks in the trenches were re-evaluated and reclassified and the original unit names depicted on the trench logs were corrected to conform with the final stratigraphic nomenclature used for the ISFSI study area. These changes have been noted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

4.0 REFERENCES

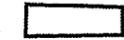
- Hartz, C.E., no date, ISFSI Site Investigation DCP, EDMS Item #993500012, 10 CFR 50 Appendix B, Criterion III, 12 p.
- PG&E Geosciences Department, 2001, Memo from William D. Page to Rob Witter of October 26, 2001, Transmittal of additional maps and plans for the DCP Used Fuel Storage project for Calculation 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.

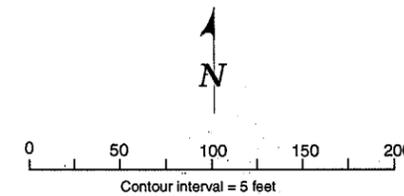
E 1,148,500

E 1,149,000



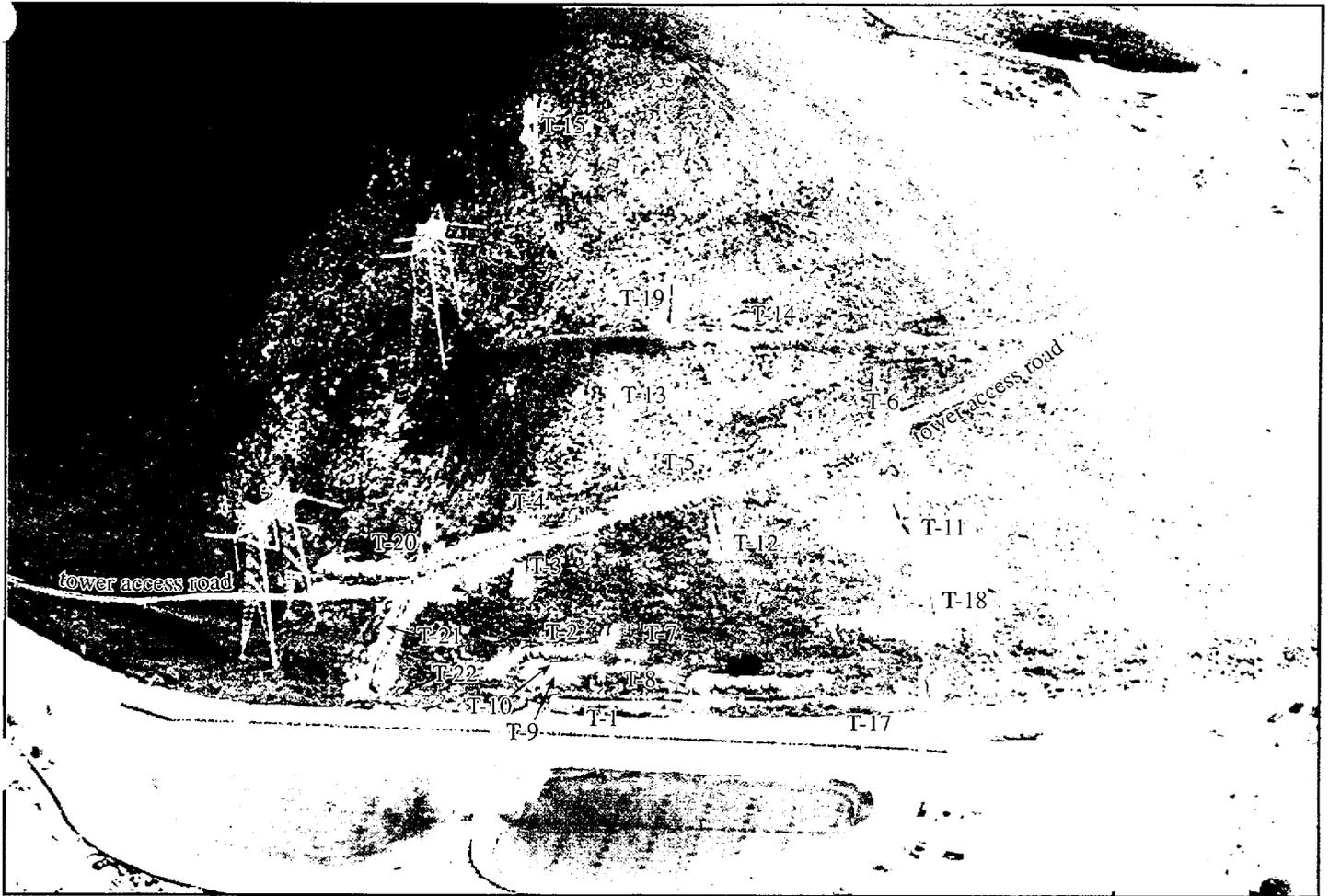
Explanation

-  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

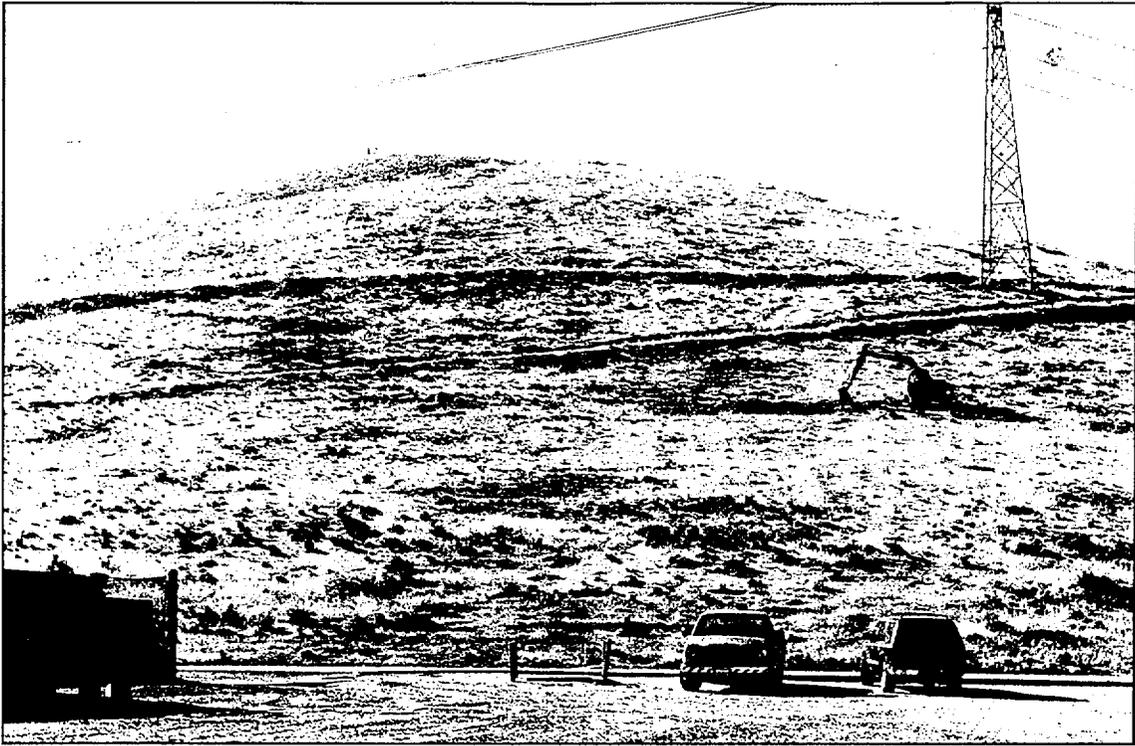
**FIGURE D-1
LOCATION OF EXPLORATION TRENCHES**



(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**

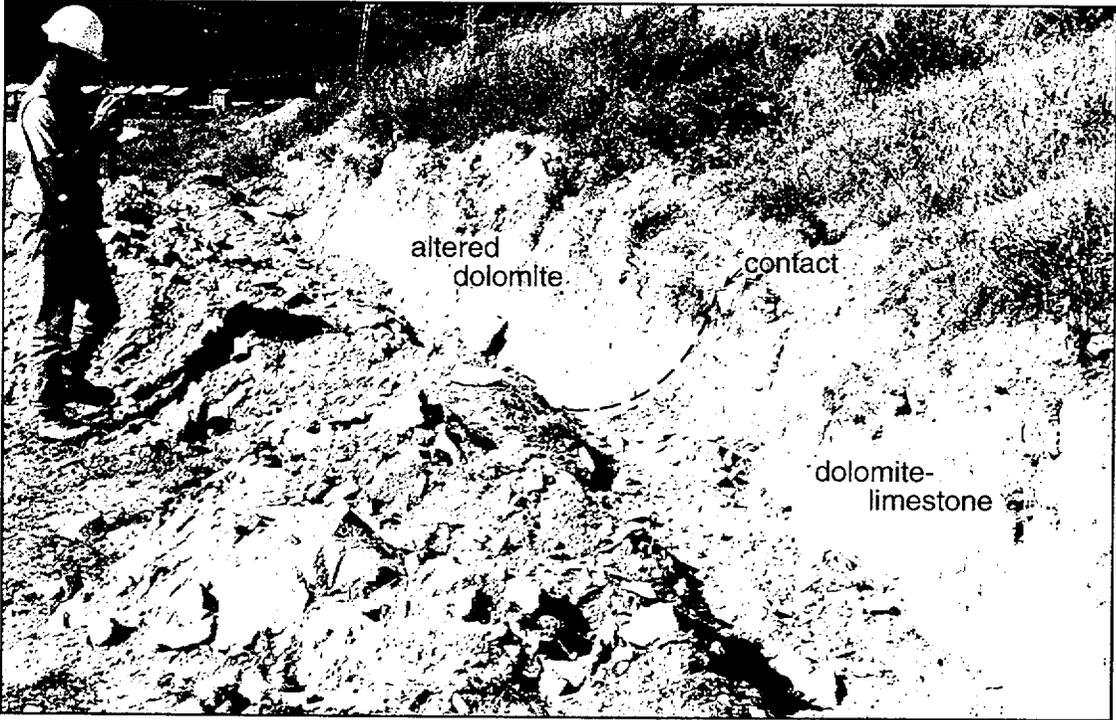


(Roll 00 JLB-2)

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**

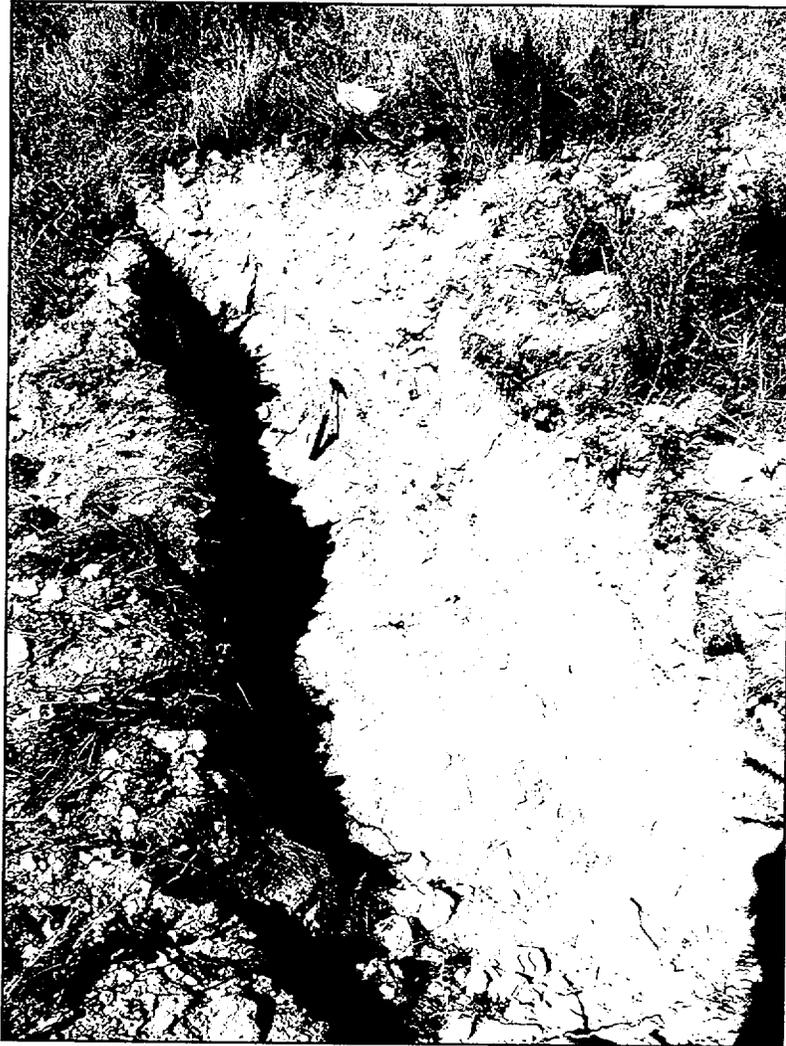


(Roll 00 00047.JPG)

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.

DIABLO CANYON ISFSI

**FIGURE D-12
TRENCH T-9**

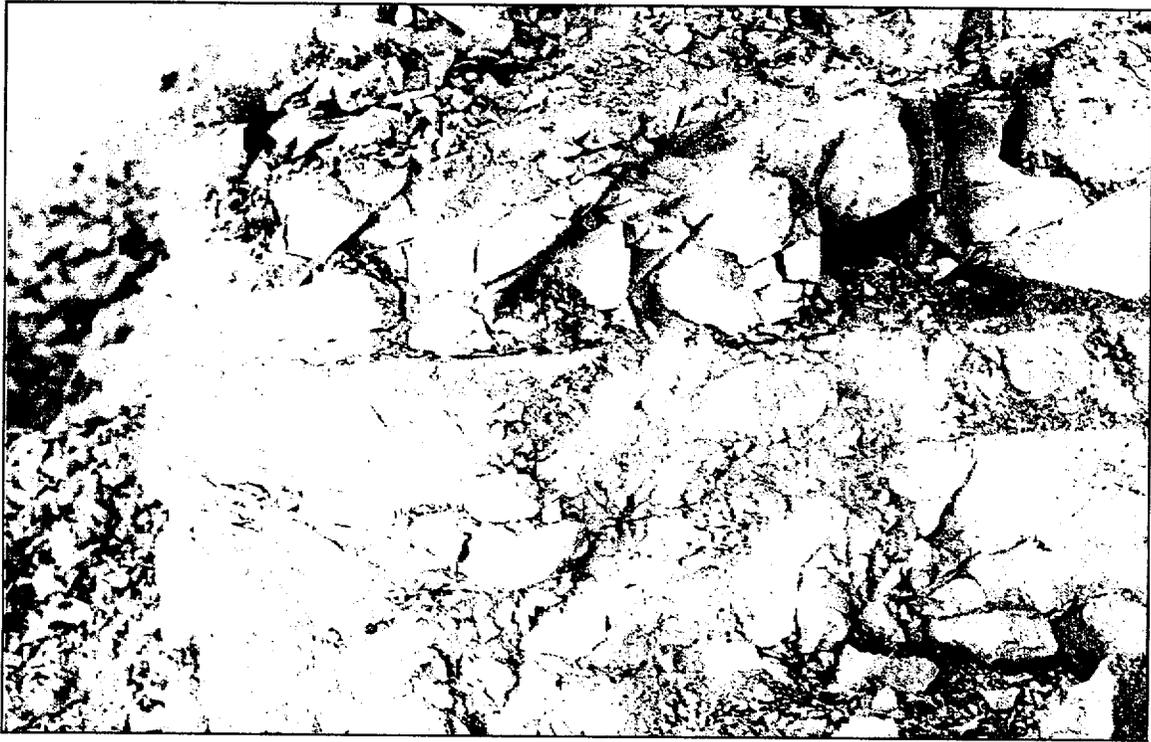


(Roll 00 00031.JPG)

Blocky dolomite in trench T-10.

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



(Roll 01 JLB-1)

Clay beds within the dolomite in T-11C.

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FIGURE D-14 TRENCH T-11



(Roll 01 JLB-1)

Dolomite in trench T-12.

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**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.

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



(Roll 00 JLB-3)

Blocky dolomite and clay bed in trench T-14.

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



(Roll 01 JLB-1)

Blocky dolomite in trench T-15.

DIABLO CANYON ISFSI

**FIGURE D-18
TRENCH T-15**

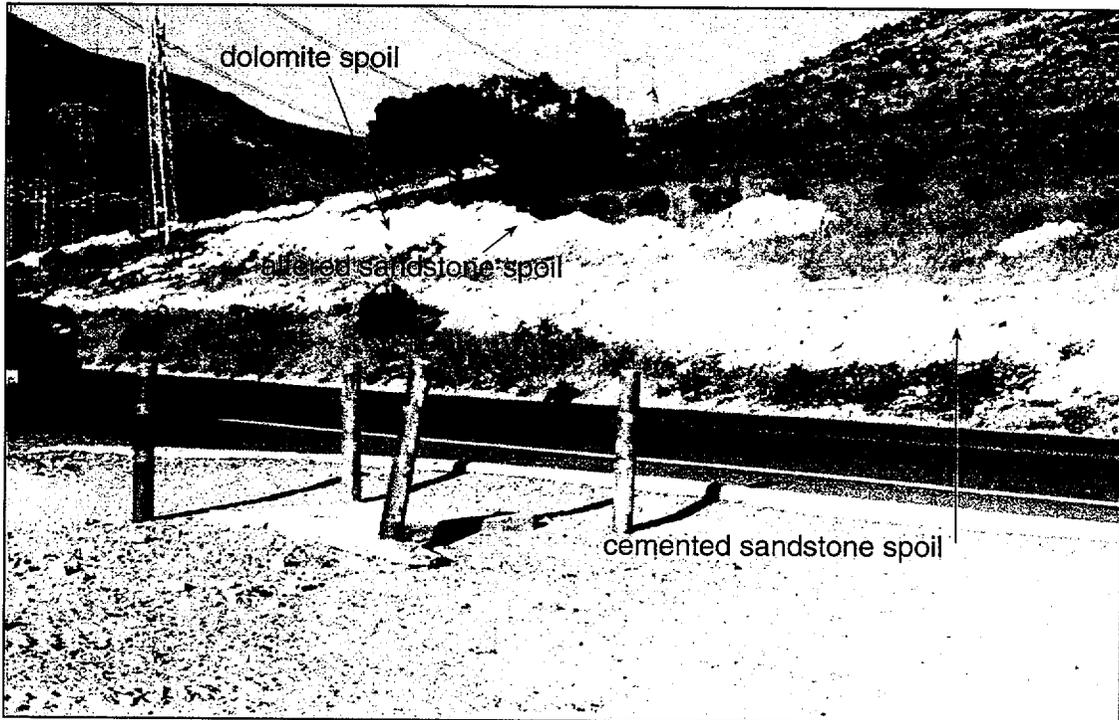


(Roll 00 00055.JPG)

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_{b-2} , and trenches T-11 and T-18 encountered dolomite of unit Tof_{b-2} . The contact between Tof_{b-2} and Tof_{b-1} 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

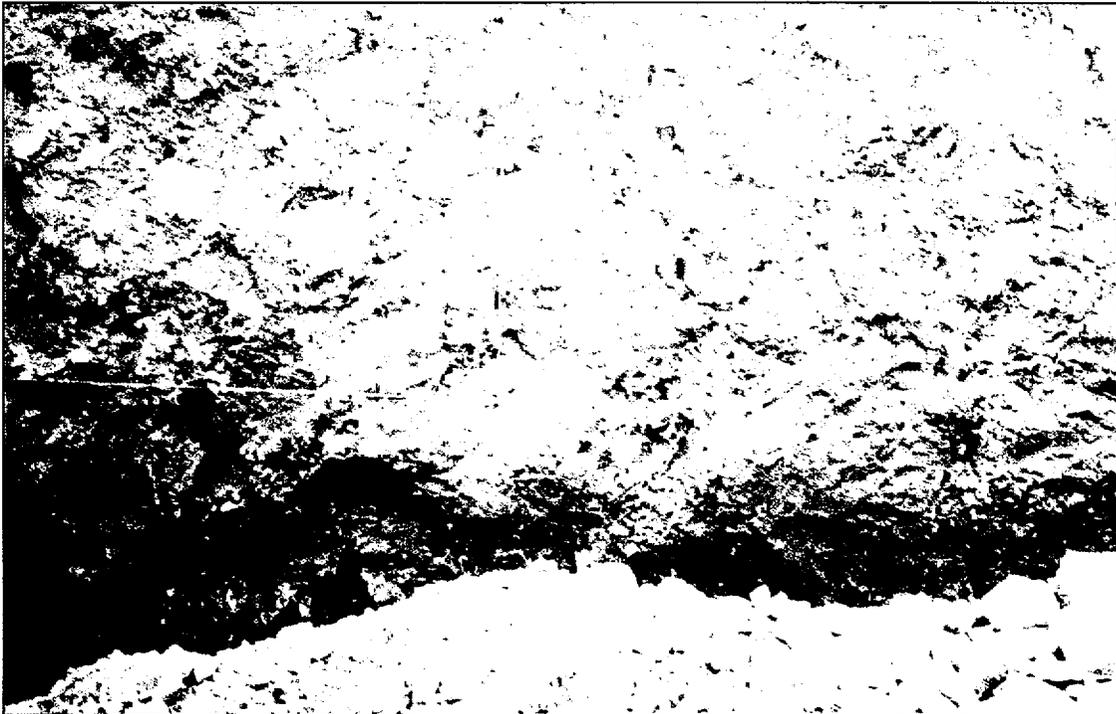


(Roll 00 JLB-3)

Blocky to massive dolomite in trench T-19.

DIABLO CANYON ISFSI

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

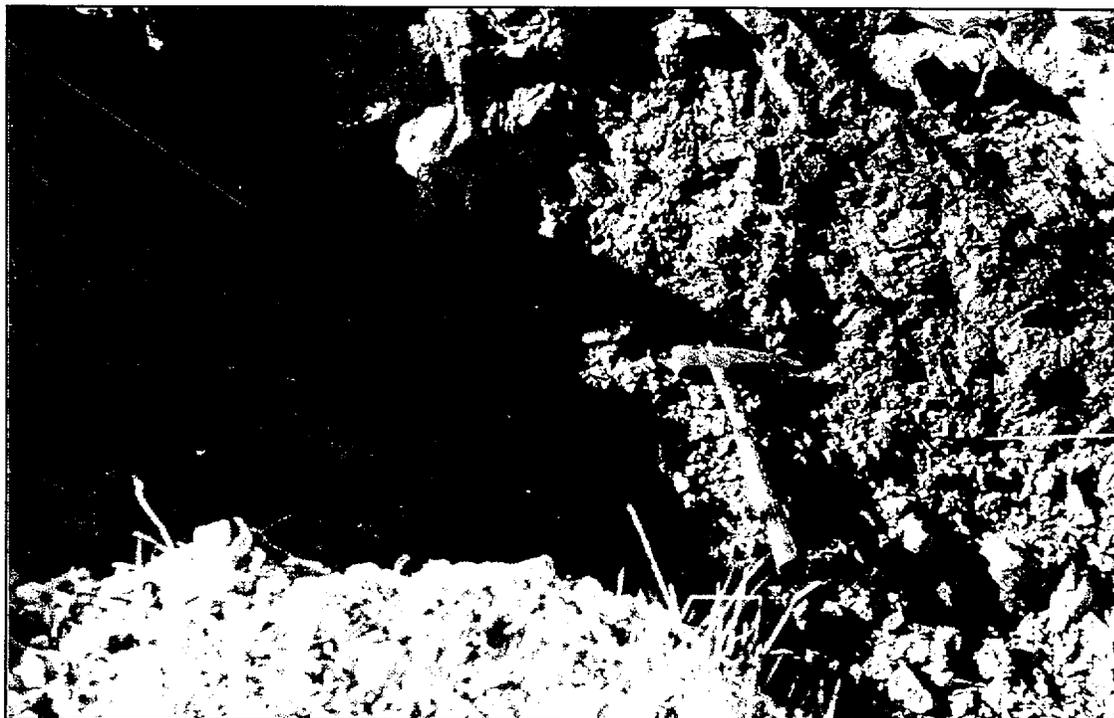


(Roll 00 JGH-2)

Altered dolomite (Tof_{b-1a}) 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_{b-1}) 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_b-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.

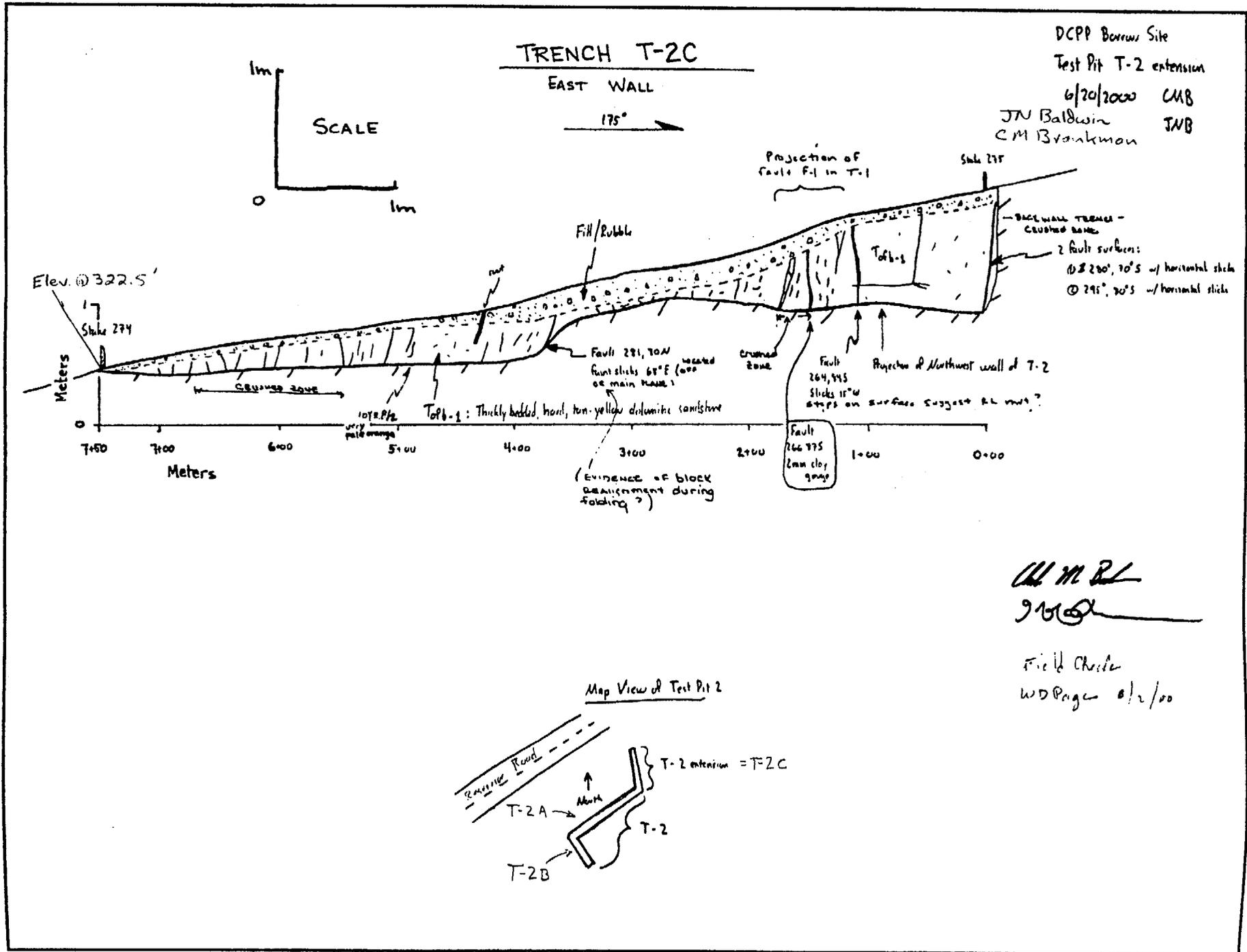
DIABLO CANYON ISFSI

**FIGURE D-25
TRENCH T-22**

ATTACHMENT 1

DATA REPORT D

FIELD TRENCH LOGS

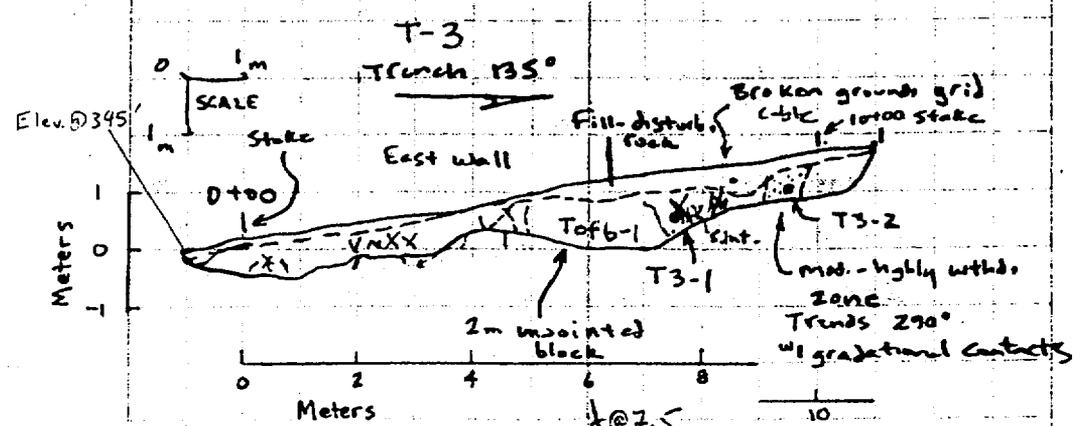


DCPP Borras Site
 Test Pit T-3
 6/11/00
 JL Bachhuber
 CM Brankman

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. wttd.
 with some localized softer, more-weathered (mod.-high)
 zones:



showing dip @ 7.5
 check:
 N65W WDP
 S57S SW
 mult. in 18° SE

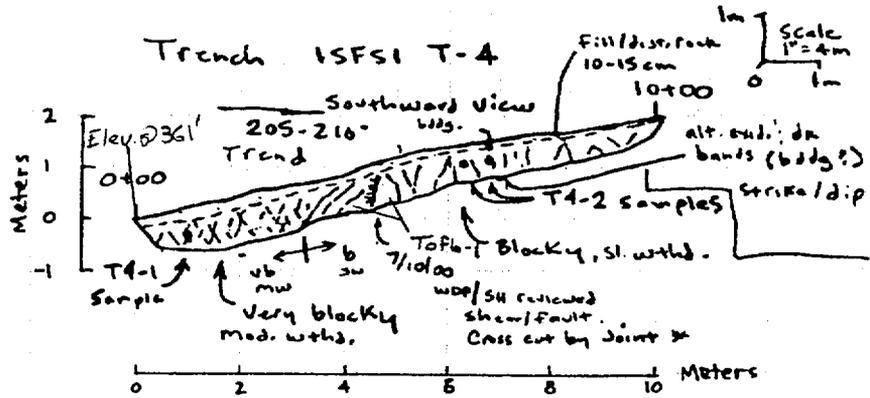
Table
 7.00 } cores
 7.50 } of WDP.
 7/10/00

Bedding? N60W, 24SW
 dip direct 214
 NO
 WDP w/ Beckh. bh

[Handwritten signatures]

DCPP Borrow Site
 Test Pit T-3
 6/11/00
 JL Bachhuber
 CM Brankman

TRENCH T-4
 SOUTHEAST WALL



Entire trench exposes same dolomitic sandstone, relatively hard. Topb-1

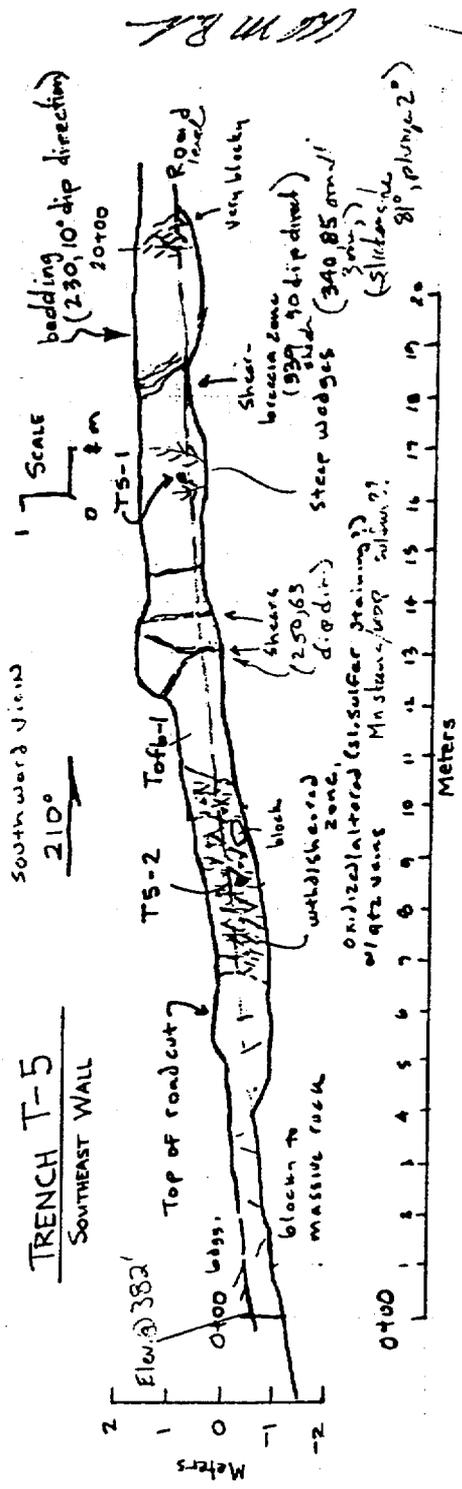
Bedding E-W 270, 6° St. 6+80

10
 C
 CMB → dipac. ↑ dp

Field Check
 W.D. Page
 8/2/00

[Handwritten signatures]

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

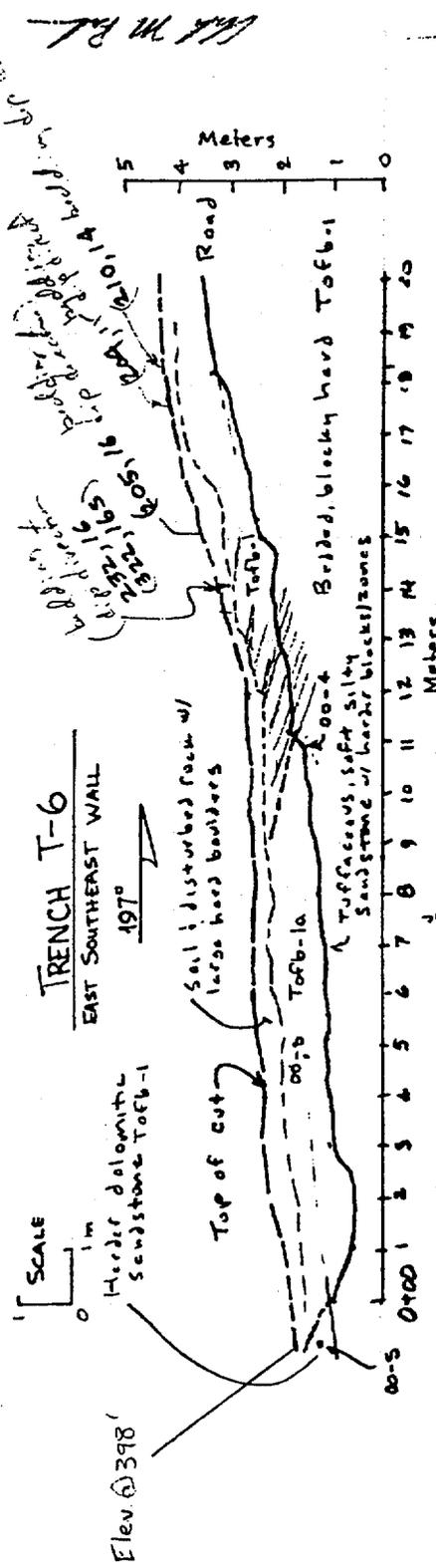


Trench 15FS1 T-5
 Tan dolomitic sandstone
 exposed throughout
 trench / road cut, (Tofb-1)
 Some zones of increased
 wthg. end faulted
 brecciation.
 Bedding laminations and
 surfaces.
 Bag. is tightly-banded
 w/ discontinuous beds
 Joints 0.25-0.5m long.
 Significant cohesion - found
 along bedding surfaces

Attitudes of structures
 recorded and discontinuity
 Characterization Form

Field sketch
 W.D.P. 8/2/00

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



Trench ISFSI T-6
Rock type changes
across trench -
Beds described as
TOFb-1 and TOFb-1 were better grouped into
unit TOFb-1 - (M.B. 1012300)

TOFb-1a Turfaceous,
yellow-tan orange
Sandstone w/ harder
blocks can give Diwack
but pervasive Hel reaction
TOFb-1 light tan-
sandy
fine-grained almost
hard, laminated strong
Hel reaction
Tuff to nodded
beds.

Field Checked
WOP: 8/2/00

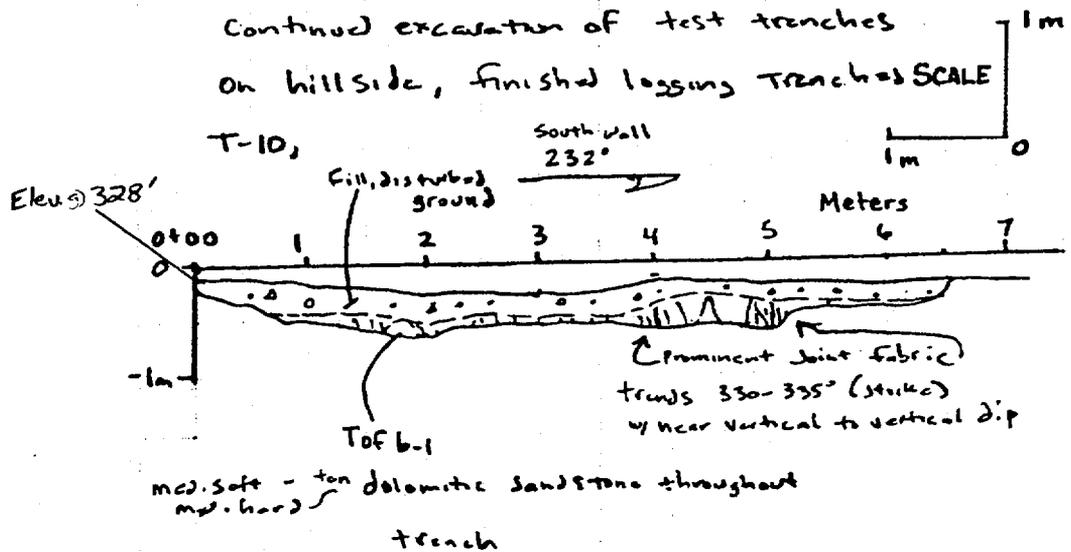
Joints & bedding
recorded on
Discontinuity
Characterization
Form

TRENCH T-10

SOUTH WALL
JL Bachhuber
CM Braukeman
6/14/00 JLB CMB

Field checked
W. Page
8/2/00

Continued excavation of test trenches
on hillside, finished logging Trenches SCALE



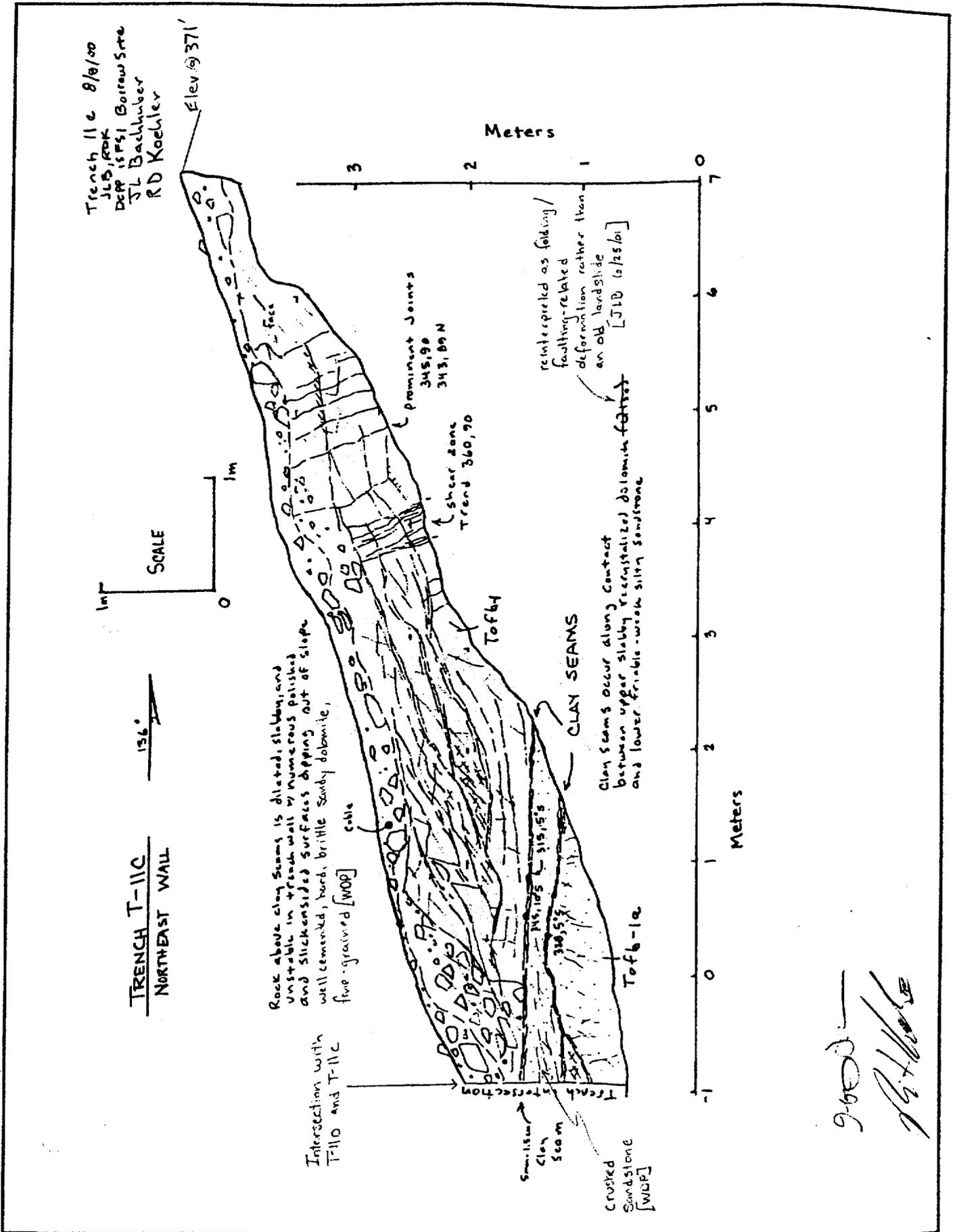
Bedrock exposed continuously across trench
floor. Rock mass is tight w/ close to widely
spaced joints (blocky to very blocky).
Some slight slickensides and manganese on
tight joint surfaces, but no gouge or crushed zones.

mapping along Reservoir Road

00-15 OBS, SON Bedding in med. to thick bedded,
hard dolomitic sandstone unit Tof b-1. High level
of confidence

JLB

W. Page

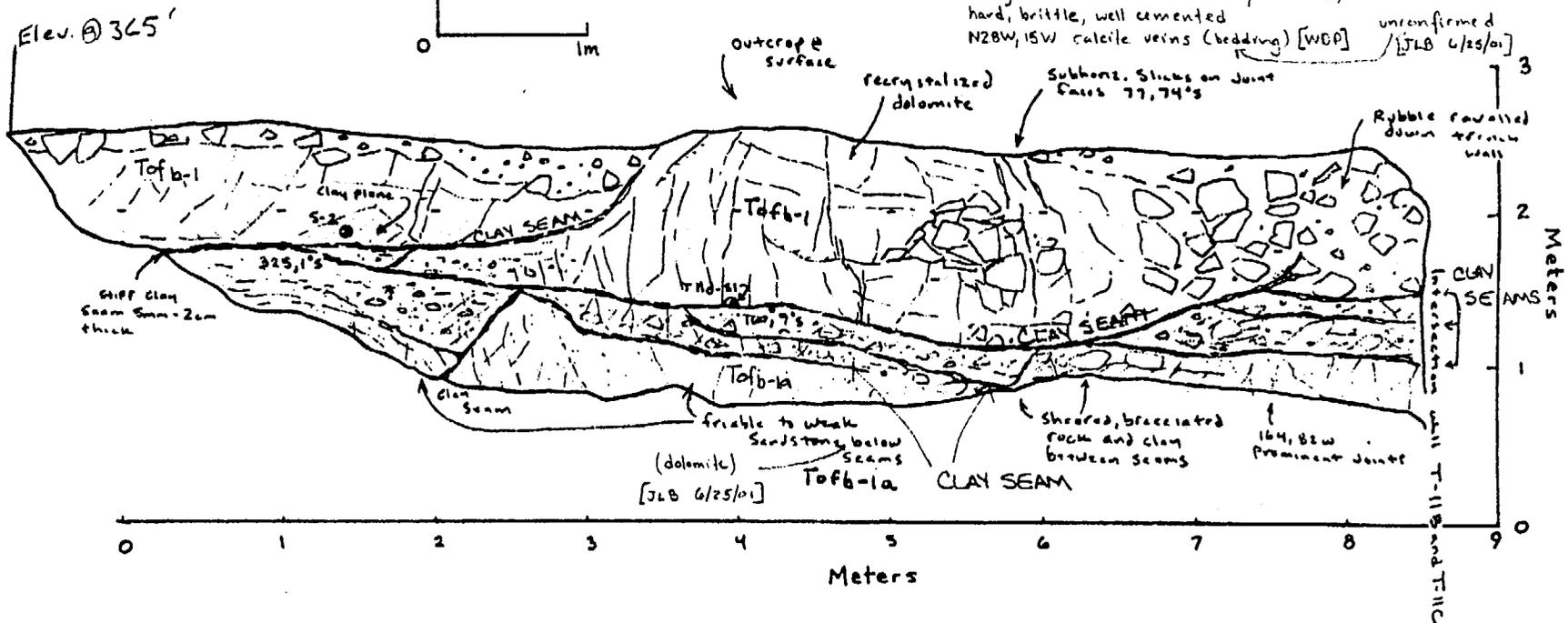
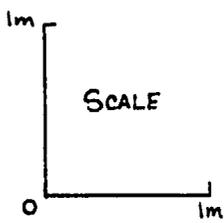


TRENCH T-11D

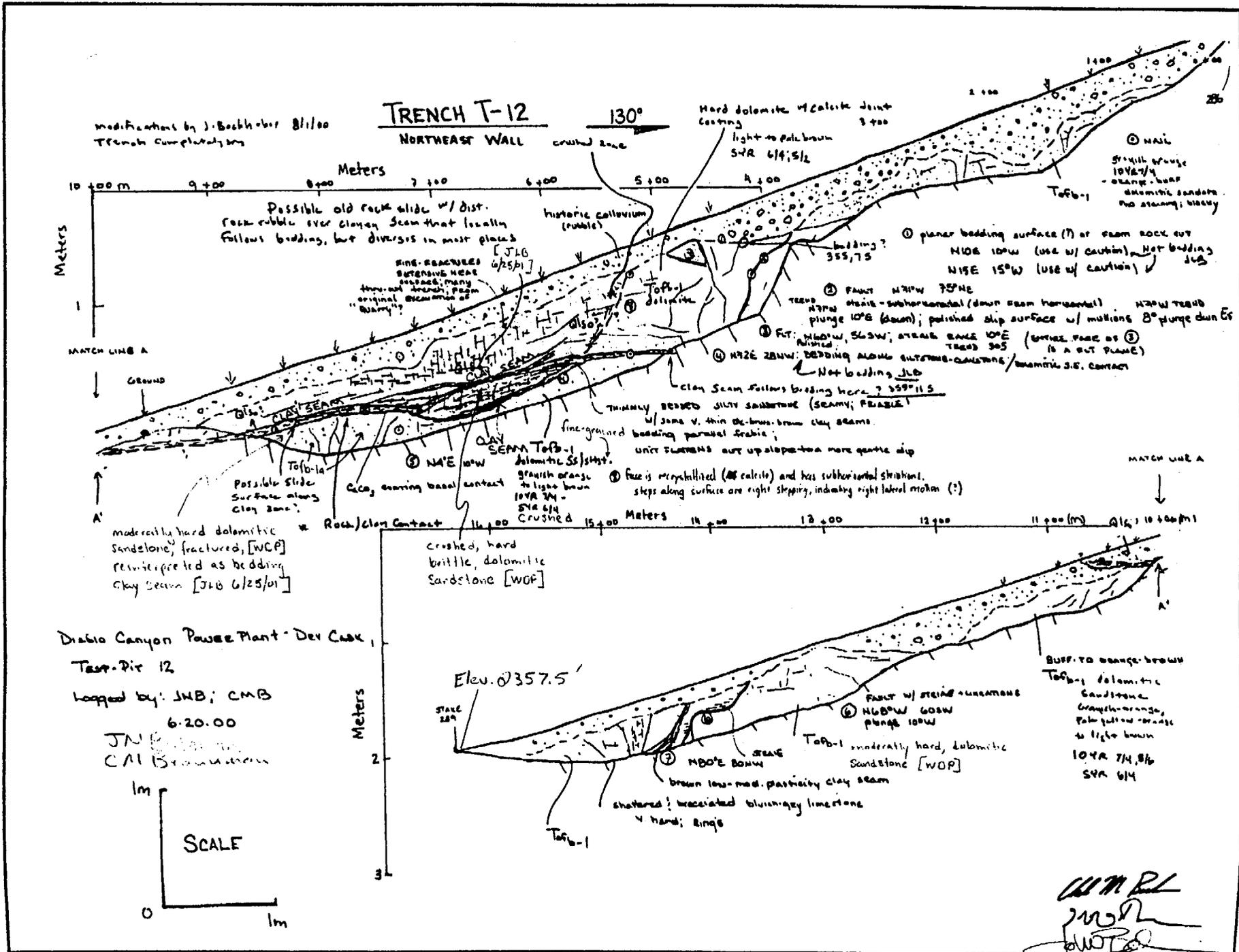
SOUTHEAST WALL

215°

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

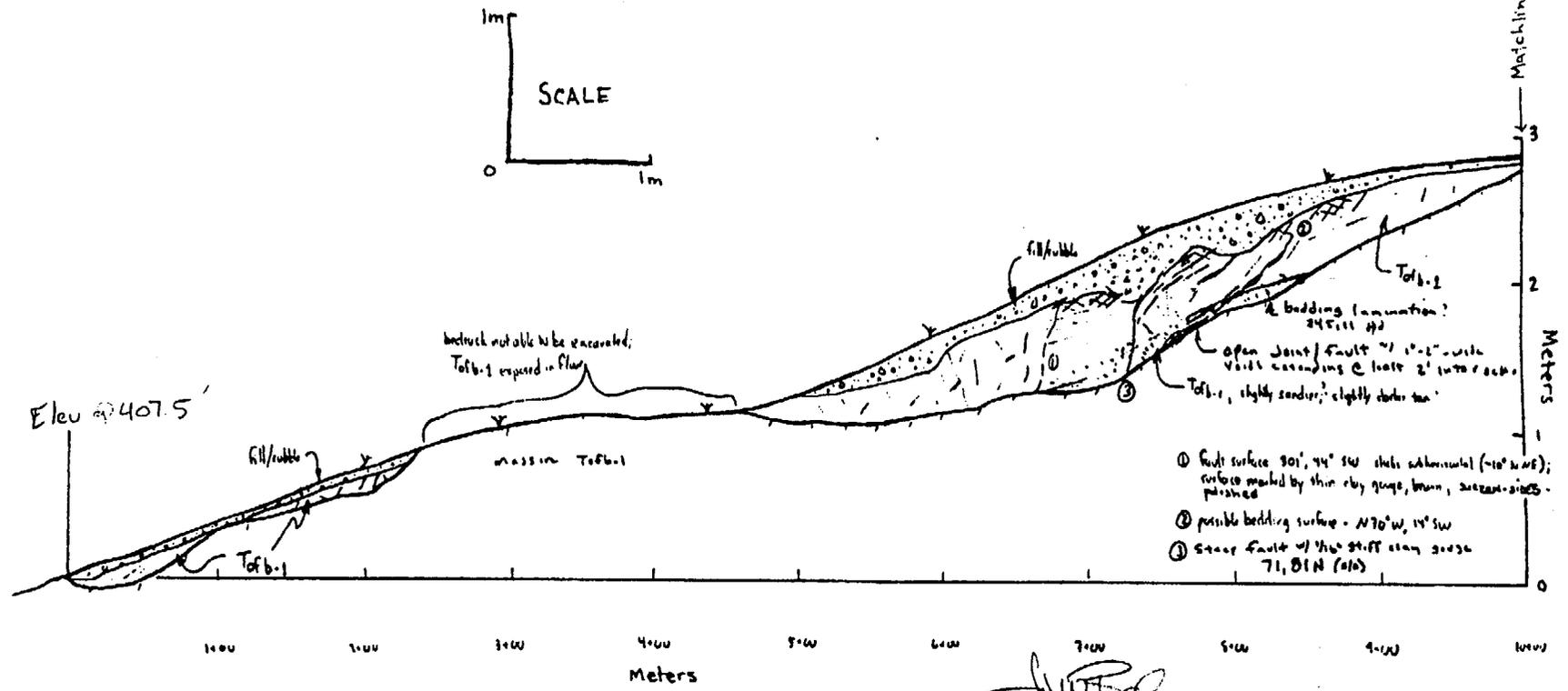
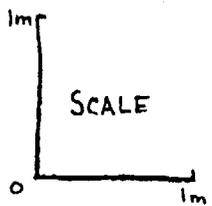
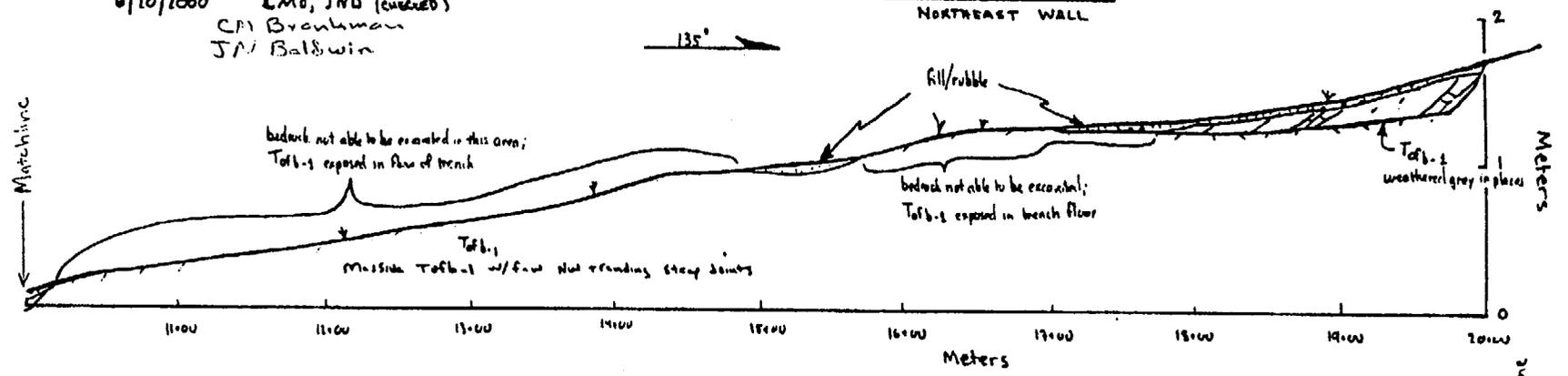


960
R.D. Koehler



DCPP ISFSI Borrow Site
Test Pit T-13
6/20/2000 KMB; JNB (checked)
CPI Brunkman
JN Baldwin

TRENCH T-13
NORTHEAST WALL



- ① fault surface 301, 74° SW steep subhorizontal (~10° NNE); surface marked by thin clay gouge, brown, calcareous, slickensided
- ② possible bedding surface - N70°W, 14° SW
- ③ steep fault w/ thin stiff clay gouge 71, 81 N (10)

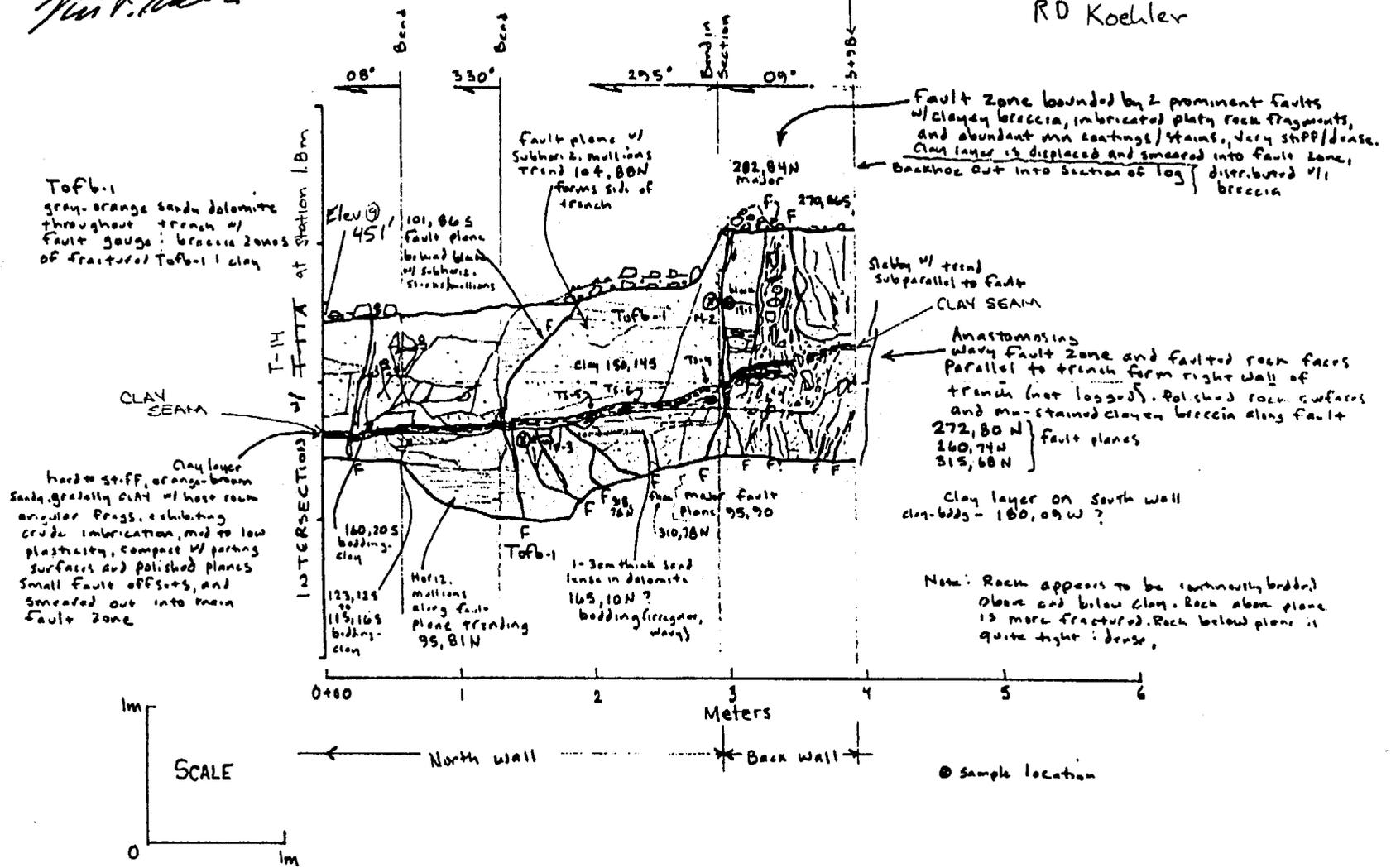
[Handwritten signature]
9/16/00

9-10-00
Nick V. Maher

TRENCH T-14B
NORTH WALL

Intersection of T-14A
at Station
2.5m

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



Tufb-1
gray-orange sand dolomite
throughout trench w/
Fault gouge: breccia zones
of fractured Tufb-1 clay

Clay layer
hard to stiff, orange-brown
sandy, generally clay w/ loose rock
angular frags. exhibiting
crude imbrication, mid to low
plasticity, compact w/ parting
surfaces and polished planes
Small fault offsets, and
smeared out into main
Fault zone

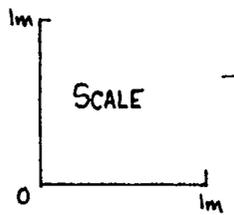
Fault zone bounded by 2 prominent faults
w/ clayey breccia, imbricated platy rock fragments,
and abundant mn coatings / stains, very stiff/dense.
Clay layer is displaced and smeared into fault zone,
Backlog out into section of log distributed w/
breccia

Slabby w/ trend
subparallel to fault
CLAY SEAM

Anastomosing
wavy fault zone and faulted rock faces
Parallel to trench form right wall of
trench (not logged). Polished rock surfaces
and mn-stained clayey breccia along fault
272, 80 N } Fault planes
260, 74 N
315, 68 N

Clay layer on south wall
clay-beds - 160, 09 W ?

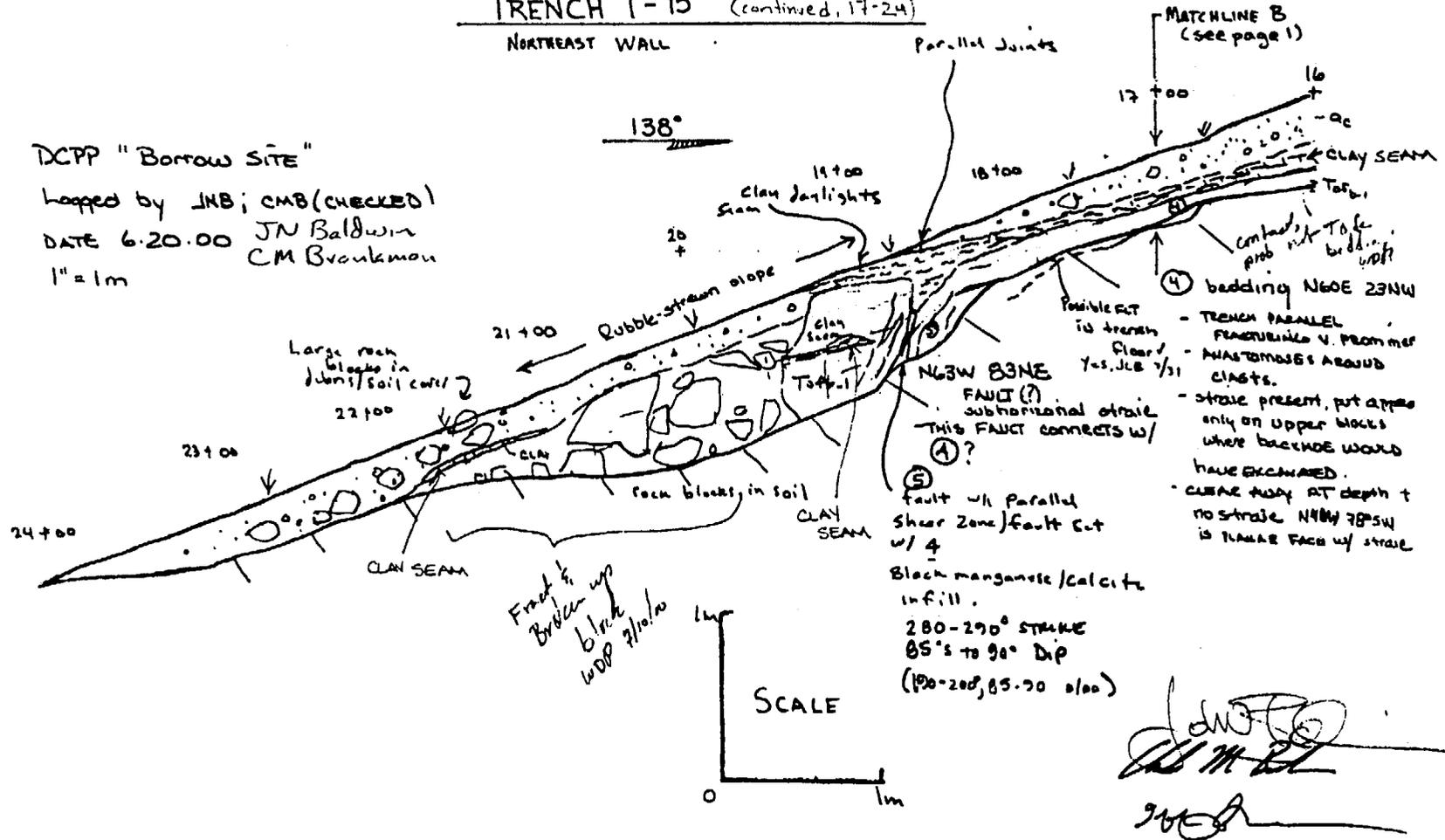
Note: Rock appears to be (uniformly bedded)
above and below clay. Rock above plane
is more fractured. Rock below plane is
quite tight & dense.



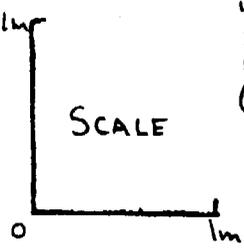
● sample location

TRENCH T-15 (continued, 17-24)

NORTHEAST WALL

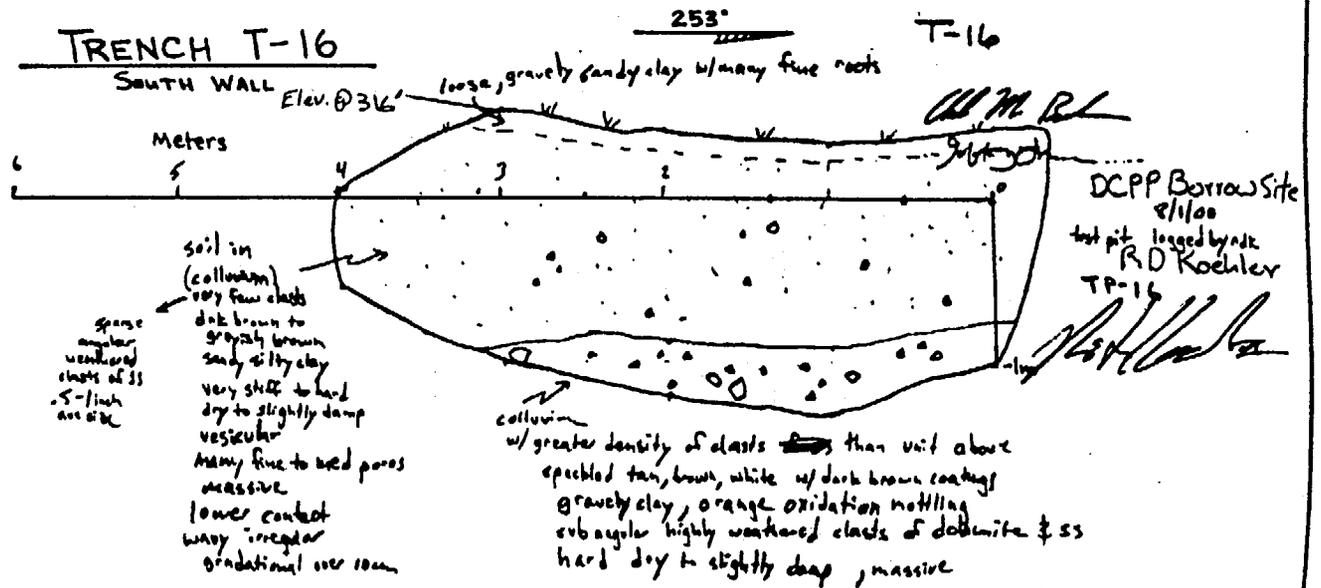
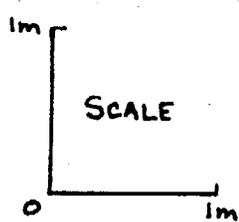


DCTP "Borrow Site"
Logged by JNB; CMB (CHECKED)
DATE 6.20.00 JN Baldwin
CM Brunkman
1" = 1m



[Handwritten signature]
9/10/00

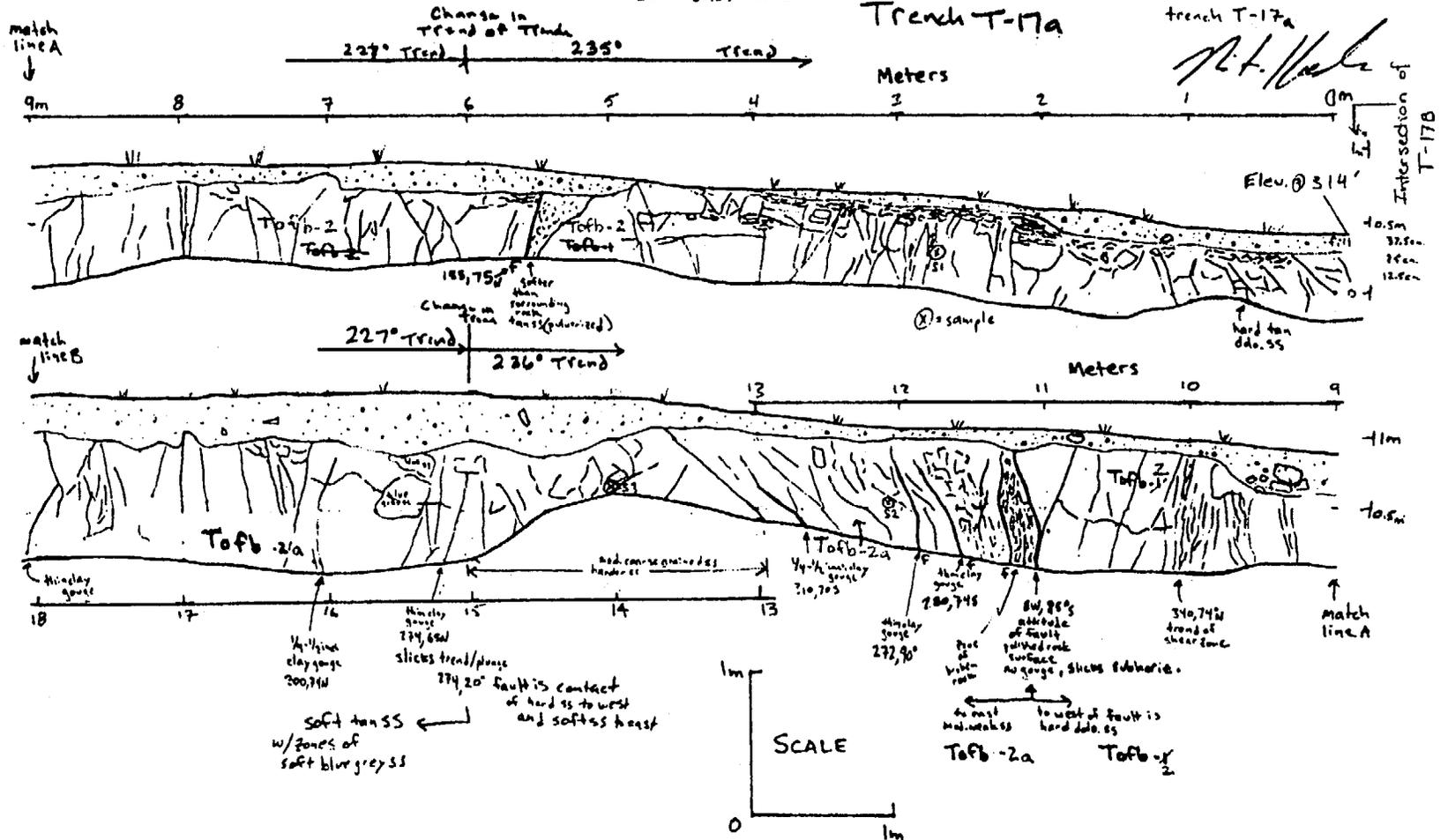
T-9 blanked out



RD Koehler
 logged by RDK 8/2/00
 Southwall of trench west of T-1
 trench T-17a

R.D. Koehler
 of
 Intersection
 T-17B

TRENCH T-17A (0-18m)
 SOUTHEAST WALL



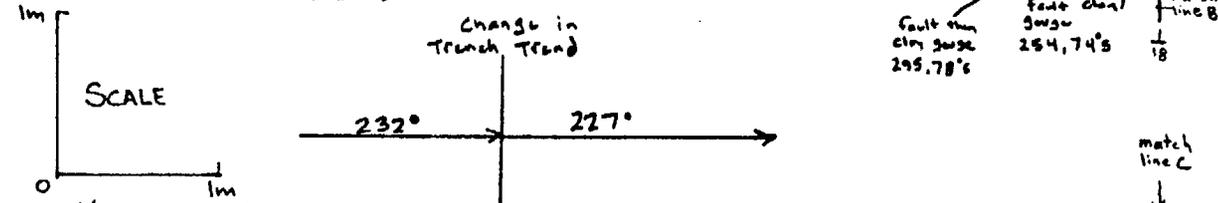
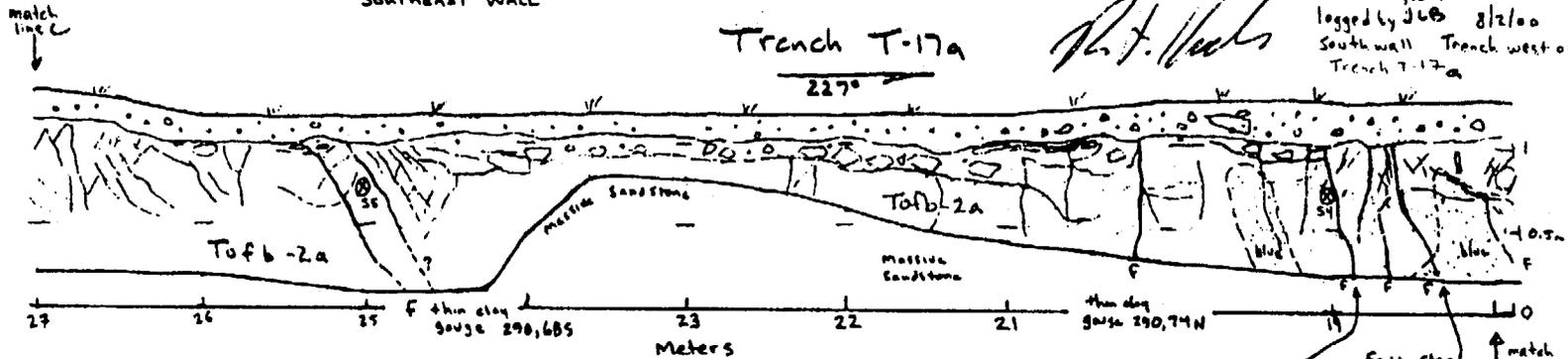
Revisions to WHITE JOB 9/19/01

DCPP ISFSI Borrow Site
Logged by: RD Koehler
JL Borshuber

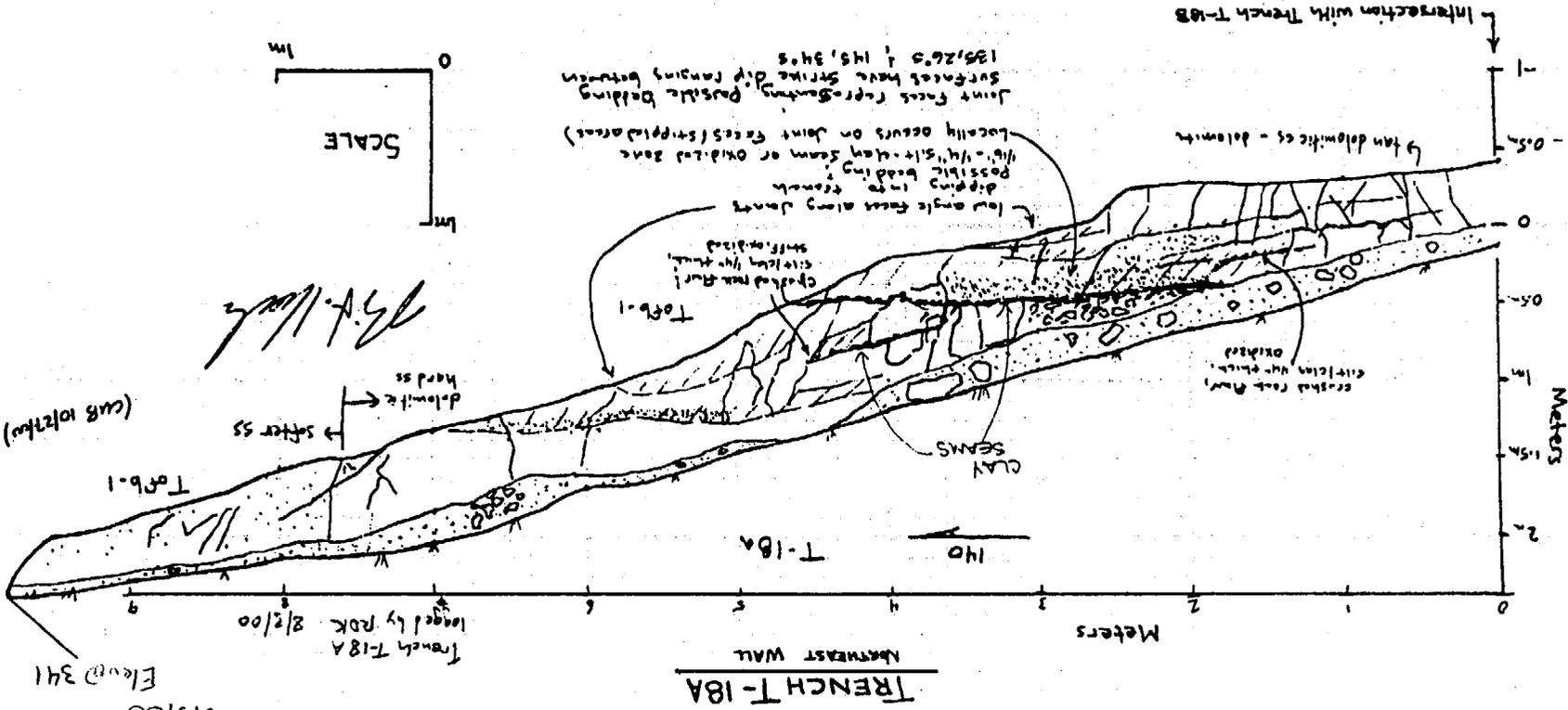
TRENCH T-17A (continued, 18-36m)
SOUTHEAST WALL

guyon
R.H. Weeks

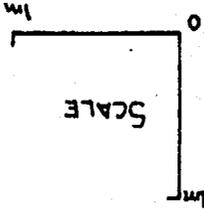
RDK
logged by JLB 8/2/00
South wall Trench west of T-1
Trench T-17a



Revisions to units JLB 8/2/01



J.T. Walker



DCPP Bureau Site
 Logged by:
 RD Koehler
 8/3/00
 Elevation 341

Trench T-18A
 logged by ROK 2/2/00

DEEP ISFSI BORROW SITE
Rock Mass Characterization
Trench T-18b
8/3/00
R. Koehler, J. Bachhuber

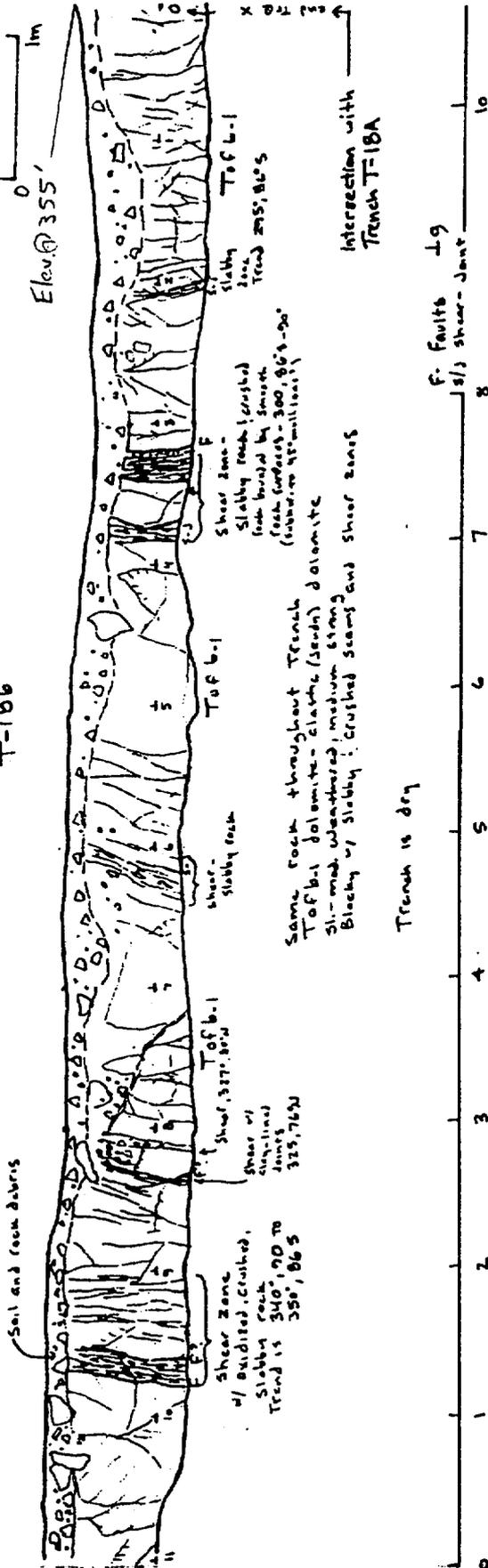
TRENCH T-18B

SOUTHEAST WALL

Handwritten signature
SCALE

230 Trend

T-18b



Trench is dry

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 0/0/01

South

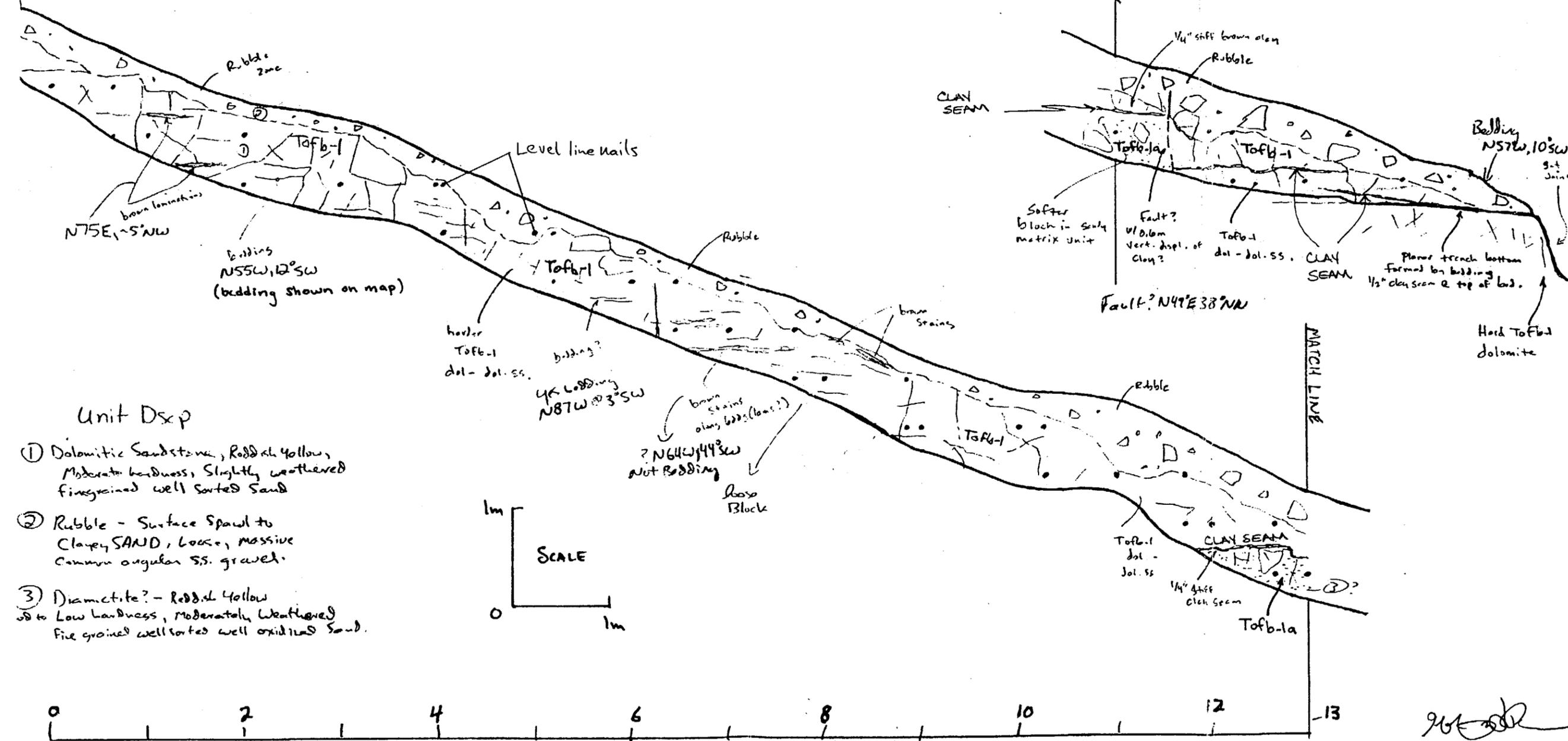
North

TRENCH T-19 (Slope)
 SOUTHWEST WALL

315°

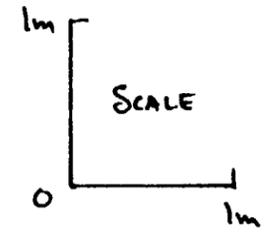
13 14 15 16

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 Diamictite? - Reddish yellow to Low hardness, Moderately weathered fine grained well sorted well oxidized Sand.



0 2 4 6 8 10 12 13

Meters

JG Helms

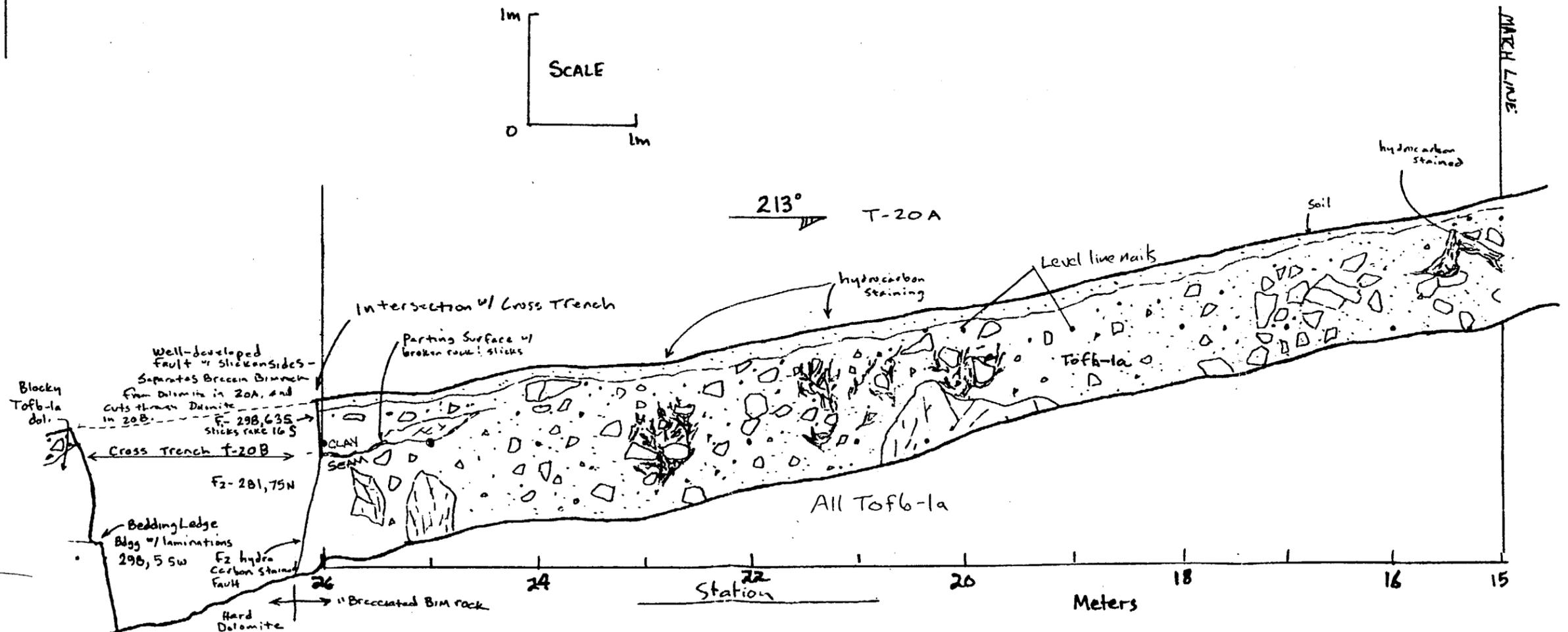
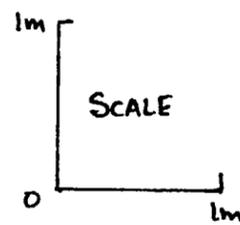
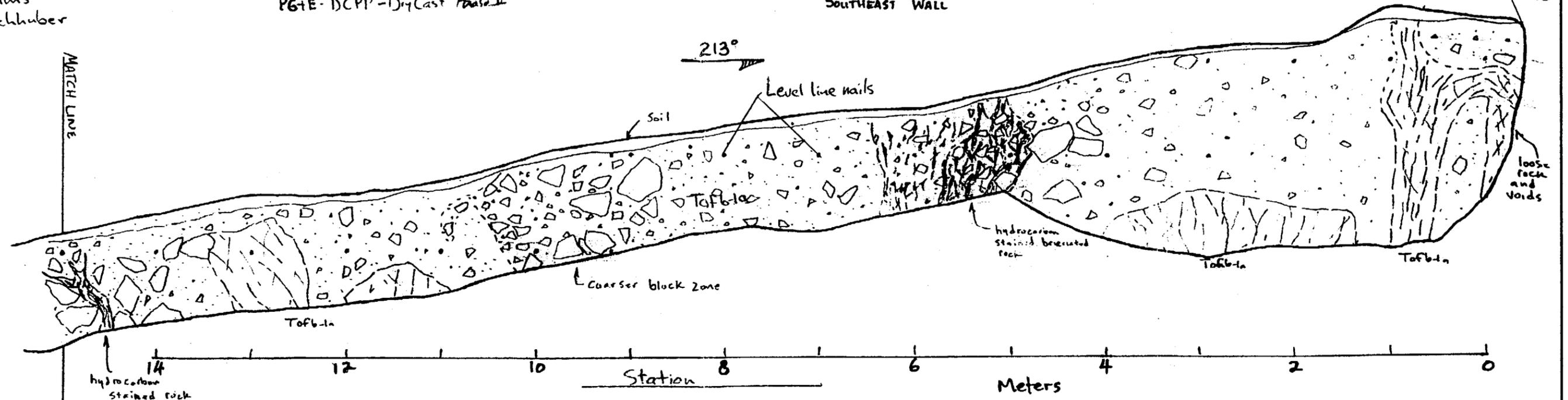
DCPP-ISFSI Borrow Site
 Logged by:
 JG Helms
 JZ Bachhuber

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

TRENCH T-20A
 SOUTHEAST WALL

West

Elev @ 370'



JG Helms
JZ Bachhuber

DCPP- ISFSI Boron Site

J.H. 12/5/00

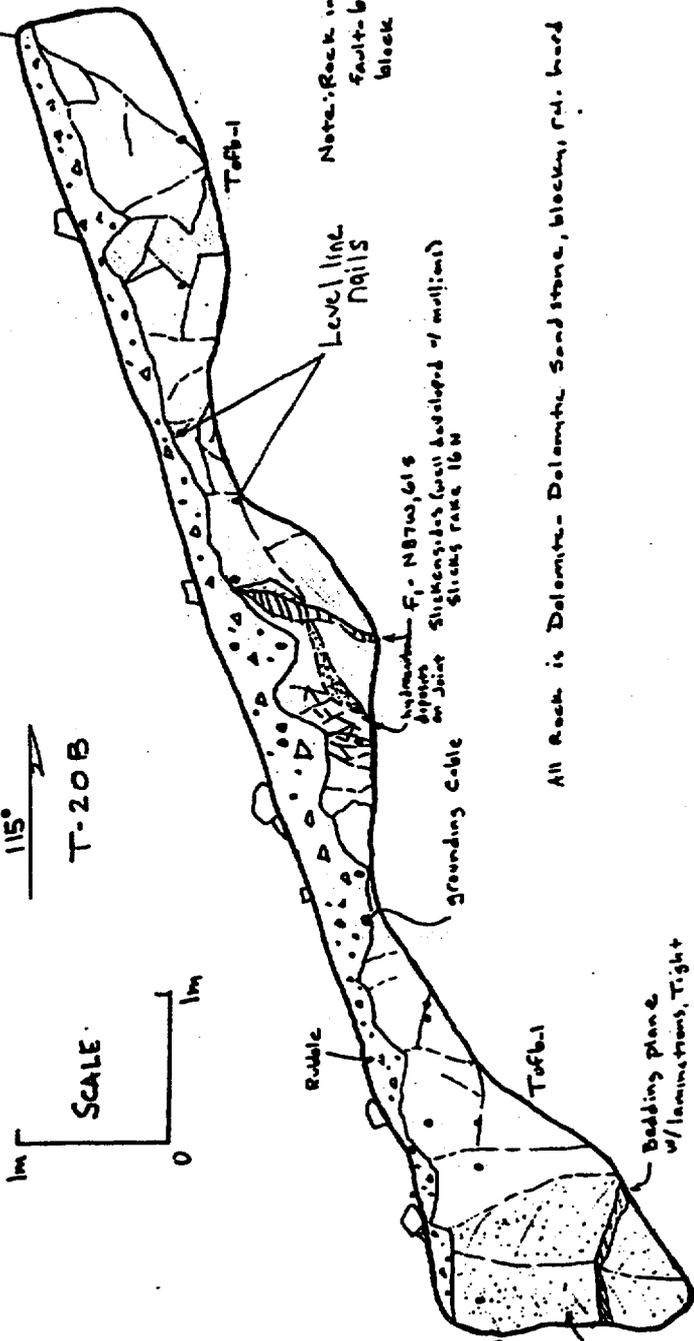
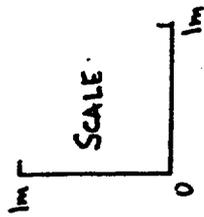
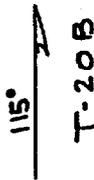
J. Beckhuber/J. Helms 12/6/00

TRENCH T-20B
Northeast Wall

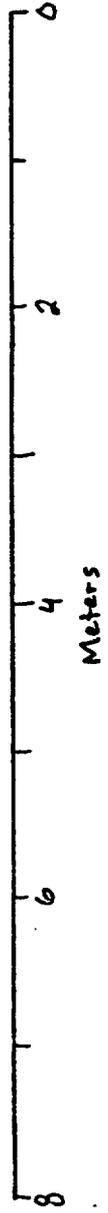
Dry Cash Phase II

T-20B

Elev. 3355'



All Rock is Dolomite - Dolomitic Sand stone, blocky, f.d. hard

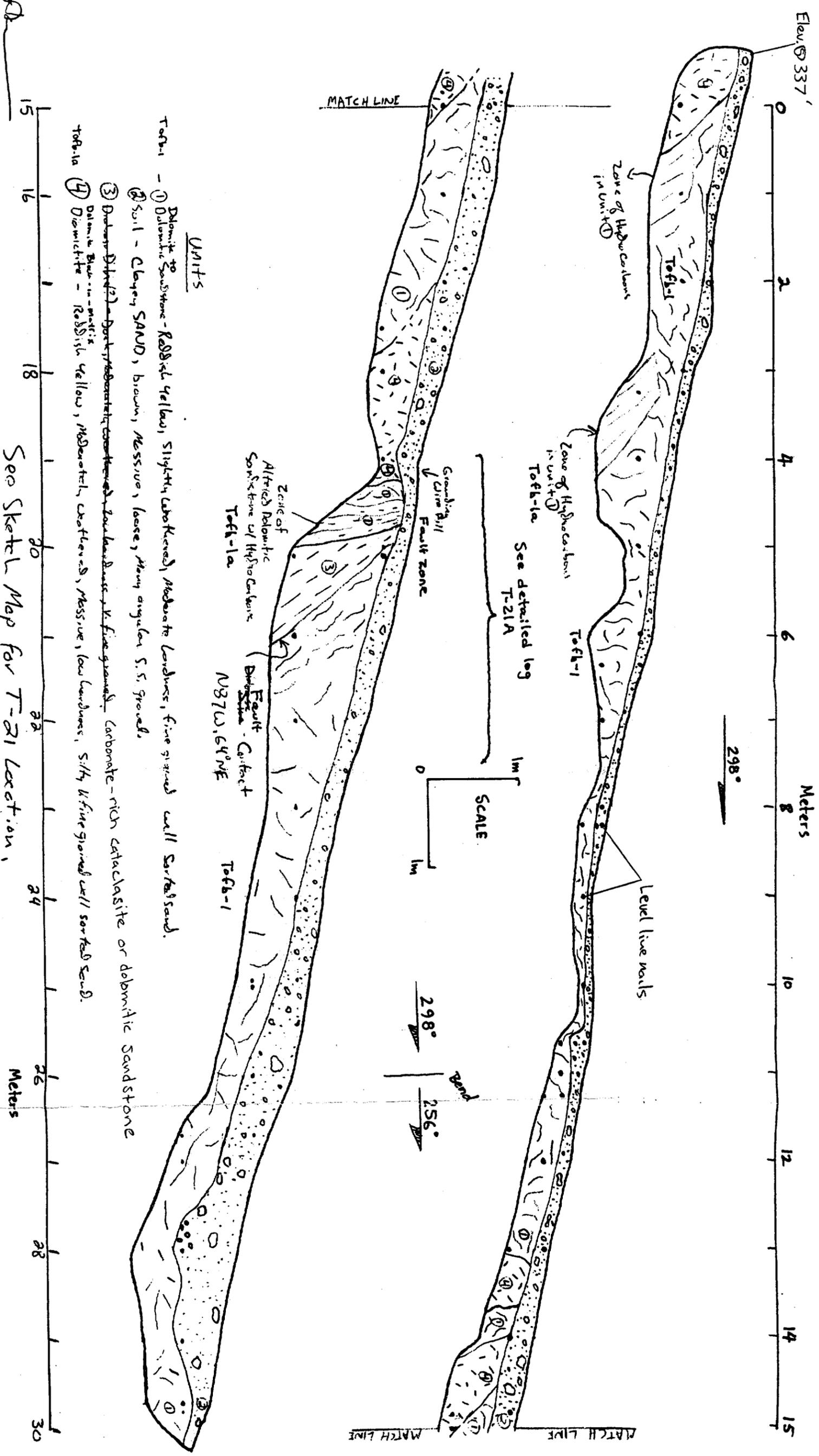


John Helms
J. Beckhuber

TRENCH T-21
 SOUTHWEST WALL

Scale 1" = 1m

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



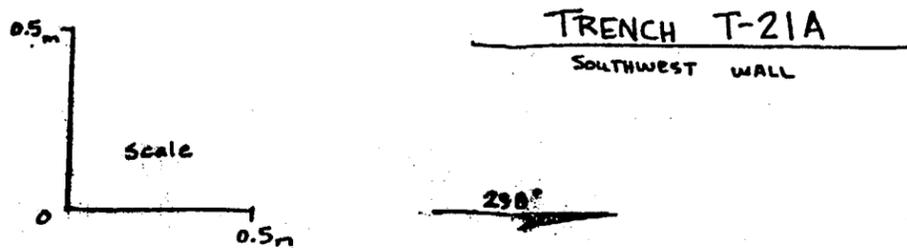
UNITS

- Tofl-1 - Dolomite to Sandstone - Reddish yellow, slightly carbonaceous, moderate coarseness, fine grained well sorted sand.
 ② Soil - Clayey SAND, brown, massive, loose, many angular S.S. gravel.
 ③ Dolomite - Dark to black, carbonaceous, moderate to coarse, fine grained, carbonate-rich cataclastic or dolomitic sandstone
 Tofl-1a ④ Dolomitic Breccia - matrix of Dolomite - Reddish yellow, moderate, fractured, massive, low coarseness, silty & fine grained well sorted sand.

See Sketch Map for T-21 Location,

JG Helms

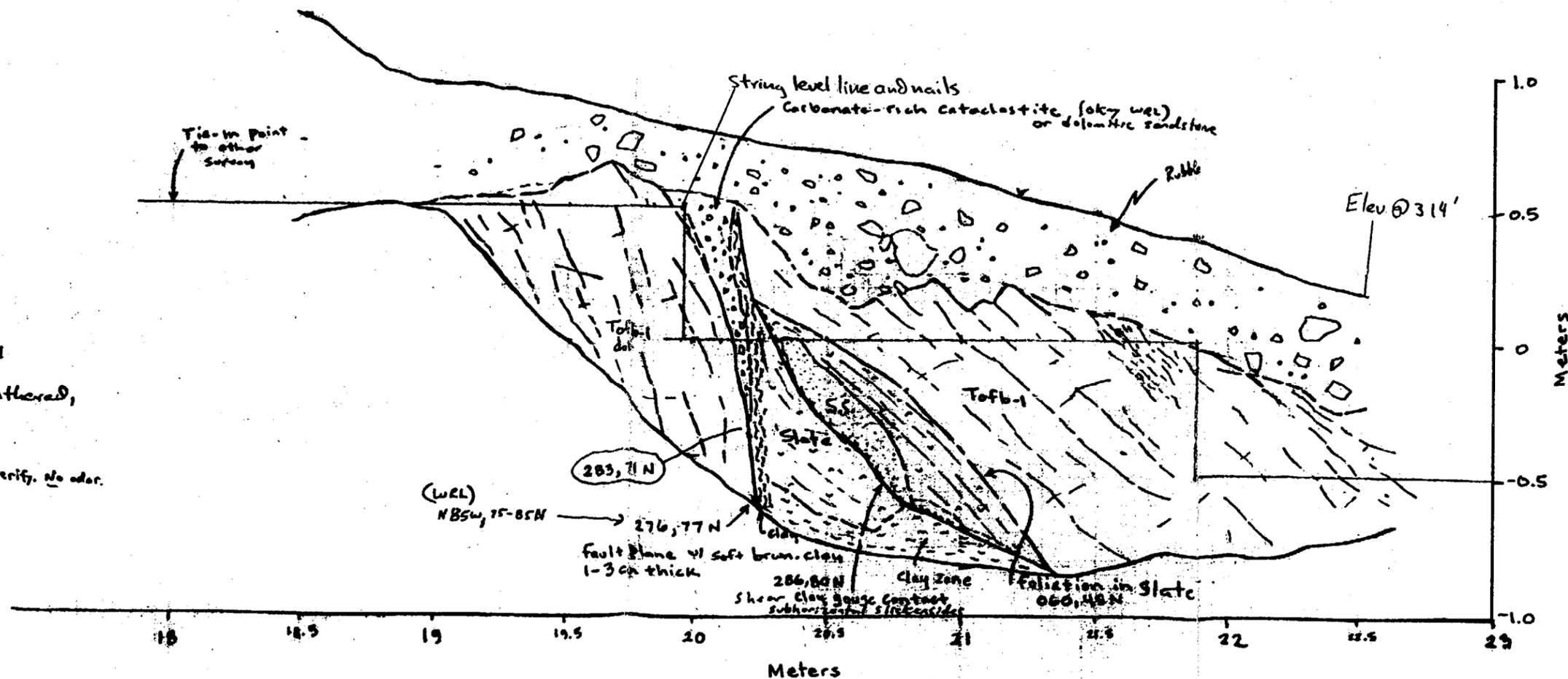
DCPP-ISFSI Borrow Site
 Trench 21A
 Detailed Log of a Trench T-21 ISFSI Project
 4/16/01 J. Helms, C. Brankman, J. Buchholz



Handwritten signatures and initials:
 J. Helms
 C. Brankman
 J. Buchholz
 ok WSP/ryg 4/16/01
 ok 4/20/01 WK/patti

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)



DCPP-ISFSI Borrow Site
 4/28/01
 Logged by
 JG Helms
 JF Backluber

9602
 JG Helms

AT check
 4/28/01
 W.R. Felt

Log of Trench 22

