Table 21-7. Comparison of seismic wave velocities in the ISFSI study area and at the DCPP power block

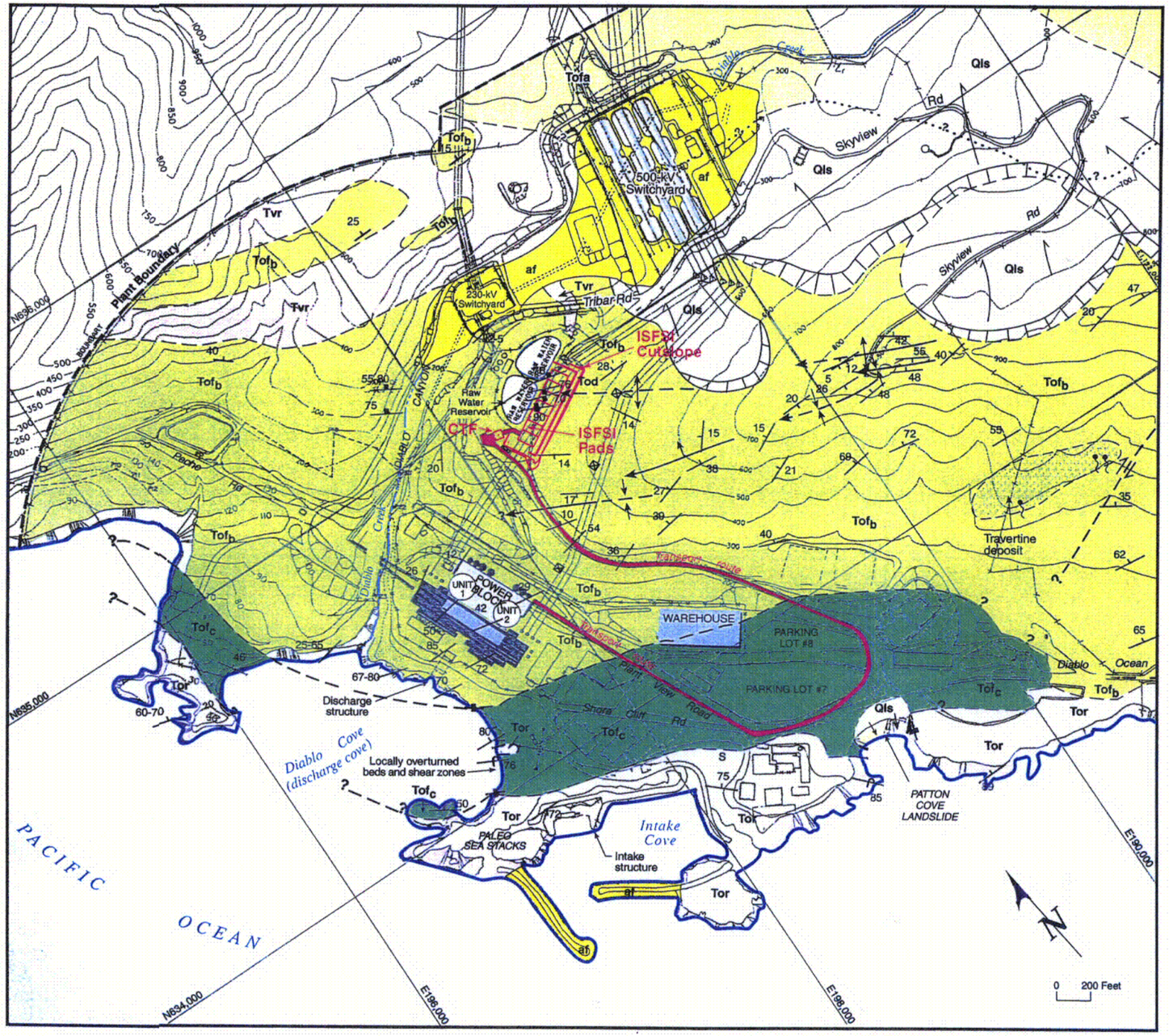
Depth Interval (Feet)	ISFSI Site	Power Block Site
5-50	Refraction Velocities Compressive Wave (Vp) [1] (feet/second) 2700-6500	Refraction Velocities Compressive Wave (Vp) [1] (feet/second) 2350-5700
5-50 50-200	Suspension Velocities Compressive Wave (Vp) [2] (feet/second) 4500-9100 7300-12700	Downhole Velocities Compressive Wave (Vp) [3] (feet/second) 2450-9800 5690-15000
10-30 30-150	Suspension Velocities Shear Wave (Vs) [2] (feet/second) 3400-4800 3100-5400	Downhole Velocities Shear Wave (Vs) [4] (feet/second) 2200-4400 2600-5400

[1] Velocities reported for rock below thin soil layer or surface disturbed zone (John A. Blume & Associates, 1968)

[2] Averaged from WLA 1998 borings

[3] Averaged from 1967 and 1977 borings DDH-1 through 4 and DDH-A through D (URS/John A. Blume & Associates, 1977)

[4] LTSP envelope (PG&E, 1988)



Data sources

Base Maps:
PG&E Civil Site Facilities Layout Plan (modified 1994)

Topography from PG&E, 1986 (and later revisions), Plot plan drawing 471124

Geology modified from:
C.A. Hall, Jr., W.G. Ernest, S. W. Prior, and J.W. Siese, 1979, Geologic map of the San Luis Obispo-San Simion region, U.S. Geological Survey Miscellaneous Investigation I-1097.

C.A. Hall Jr., 1973, Geolgoic map of the Morro Bay South and Port San Luis Quadranges, San Luis Obispo County, California, U.S. Geological Survey Miscellaneous Field Studies Map MF-511, scale 1:24,000.

Explanation

- **af** Artificial fill (engineered), only major fills shown
- **Qls** Quaternary landslide deposits
- **Tvr** Volcanic rock (middle Miocene), diabase intrusive sills and dikes

Tertiary

Obispo Formation

(lower and middle Miocene) - bedded dolomitic sandstone, siltstone, and claystone with tuffaceous beds, locally calcareous, some chert and volcanic rock lenses

Member Tof - Sandstone and dolomite

- **Tof_a** Unit a - diatomaceous siltstone and tuffaceous sandstone; yellow-brown to tan; thick to massive bedding
- **Tof_b** Unit b - dolomite, dolomitic siltstone, dolomitic sandstone and sandstone, medium to very thick bedding
- **Tof_c** Unit c - shale, claystone and siltstone, thin to medium bedding extensively sheared
- **Tor** Member Tor - Volcanic rock, zeolitized and silicified tuff

–? Bedrock fault or shear zone, dashed where approximate, queried where uncertain, arrows show sense of displacement

—·—·? Geologic contact, solid line where well-defined, dashed where approximate, queried and/or dotted where uncertain

Cut or fill slope

Large landslides. Arrows indicate direction of movement, hachures define head scarp. (Smaller landslides are not shown)

500-kV tower

10 Generalized strike and dip of bedding

Parasitic folds on south limb of Pismo syncline

Axis of anticline, plunge indicated by larger arrow, dashed where approximately located

Axis of syncline, plunge indicated by larger arrow, dashed where approximately located

Axis of monocline, plunge indicated by larger arrow, dashed where approximately located

Steep sea cliff

65 Strike and dip of fault

Spring

Note: Except for small faults at and near the ISFSI site, only major geologic structures and bedrock units, and large landslides, are shown.

C01

DIABLO CANYON ISFSI

FIGURE 21-1
GEOLOGIC MAP OF BEDROCK AND LANDSLIDES IN THE PLANT SITE AREA

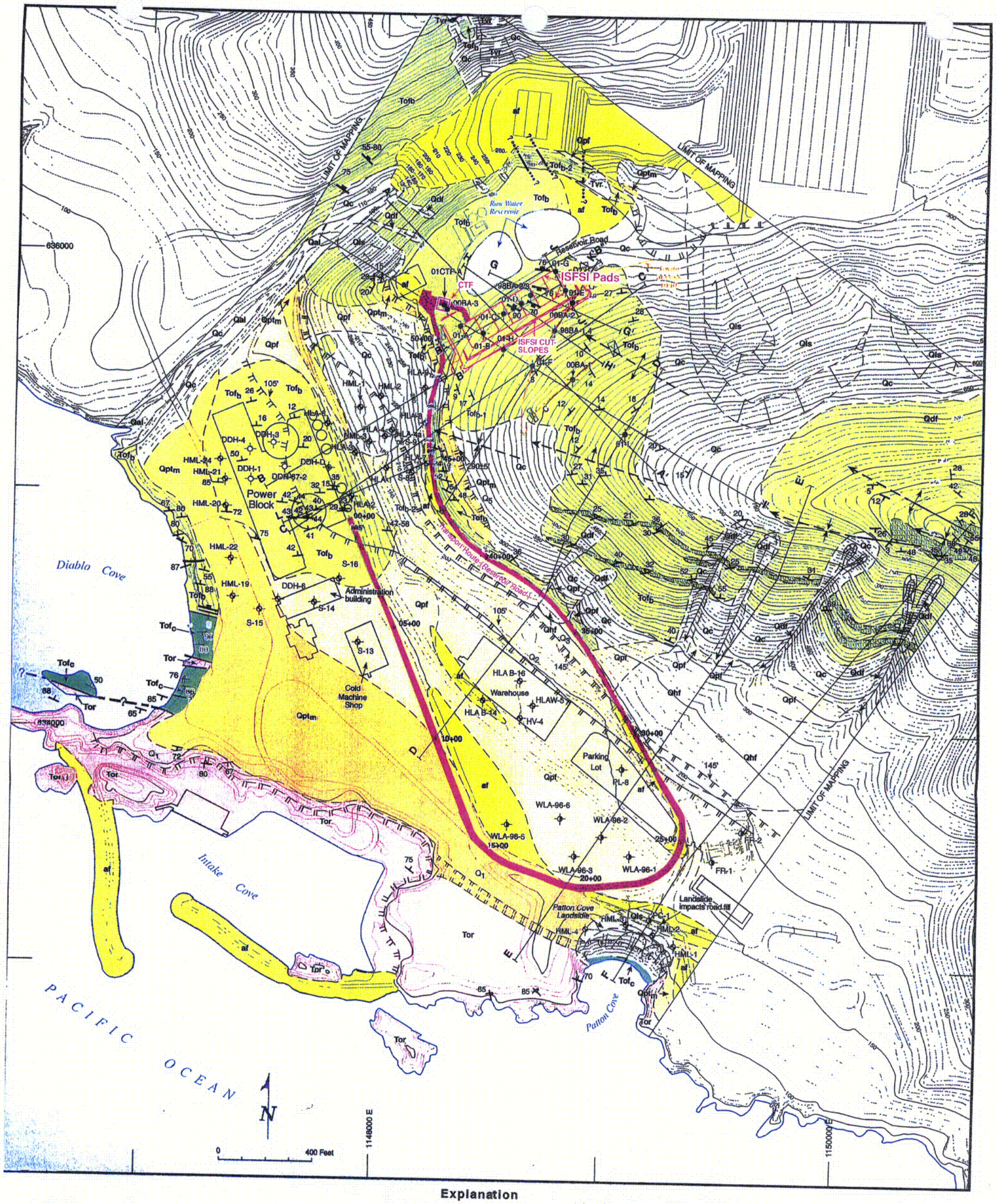
Southeastward aerial view of the ISFSI study area. The photo shows the exploratory test trenches excavated within, and above, the ISFSI. Hummocky ground and bowl-shaped depressions in the south wall of Diablo Canyon, east of the ISFSI study area, are large, old landslides. In contrast, laterally-continuous beds of sandstone and dolomite visible on the west slope of the ridge to the south of the ISFSI study area are undisturbed and demonstrate the absence of large scale landslides in this area. Photo Roll JLB AR-1.

DIABLO CANYON ISFSI

FIGURE 21-2
AERIAL VIEW OF THE ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2 December, 2001

C02



Explanation

Quaternary

- af — Artificial fill (engineered)
- Qal, Qdf, Qc, Qls, Qhf — Quaternary deposits - alluvium, debris flow, colluvium, landslide, Holocene colluvial fan
  - NOTE: Only surficial deposits greater than about 5 feet thick shown
- Qpf — Pleistocene colluvial fan
- Qptm — Pleistocene marine terrace deposit (inferred)

Tertiary

- Tvr — Volcanic rock (middle Miocene), diabase intrusive sills and dikes
- *Obispo Formation (lower and middle Miocene)*
- Tofb — Member Tof, Unit b - dolomite, dolomitic siltstone, dolomitic sandstone, and sandstone, medium to thick bedded. (Prominent outcrops)
- Tofc — Member Tof, Unit c - shale, claystone and siltstone, thin to medium bedding, extensively sheared.
- Tor — Member Tor - volcanic rock, zeolitized and silicified tuff

Geologic contact, solid line where well-defined, dashed where approximate, queried where uncertain.

Fault, dashed where approximate, queried where uncertain

Landslides, arrows indicate direction of movement, hachures define headscarp region

Qdf — Debris flow path

Axis of syncline, larger arrow shows plunge, dashed where approximate

Axis of anticline, larger arrow shows plunge, dashed where approximate

Axis of monocline, larger arrow shows plunge, dashed where approximate

290' Q2 — Buried shoreline, angle of marine terrace wave cut platform; number and elevation indicated

Footprint of 500-kV tower

85 — Strike and dip of fault

10 — Strike and dip of bedding

85 — Overturned bedding

Horizontal bedding

Boring from 1967 power block study

1977 boring DDH-D at power block

Boring from previous HLA and HML studies

Boring for ISFSI investigations, WLA 1998 to 2001

Boring for ISFSI siting investigations, WLA 1996 to 1998

Transport route; stippled where transport route will be underlain by new engineered fill

B — B' Geologic cross section

CD3

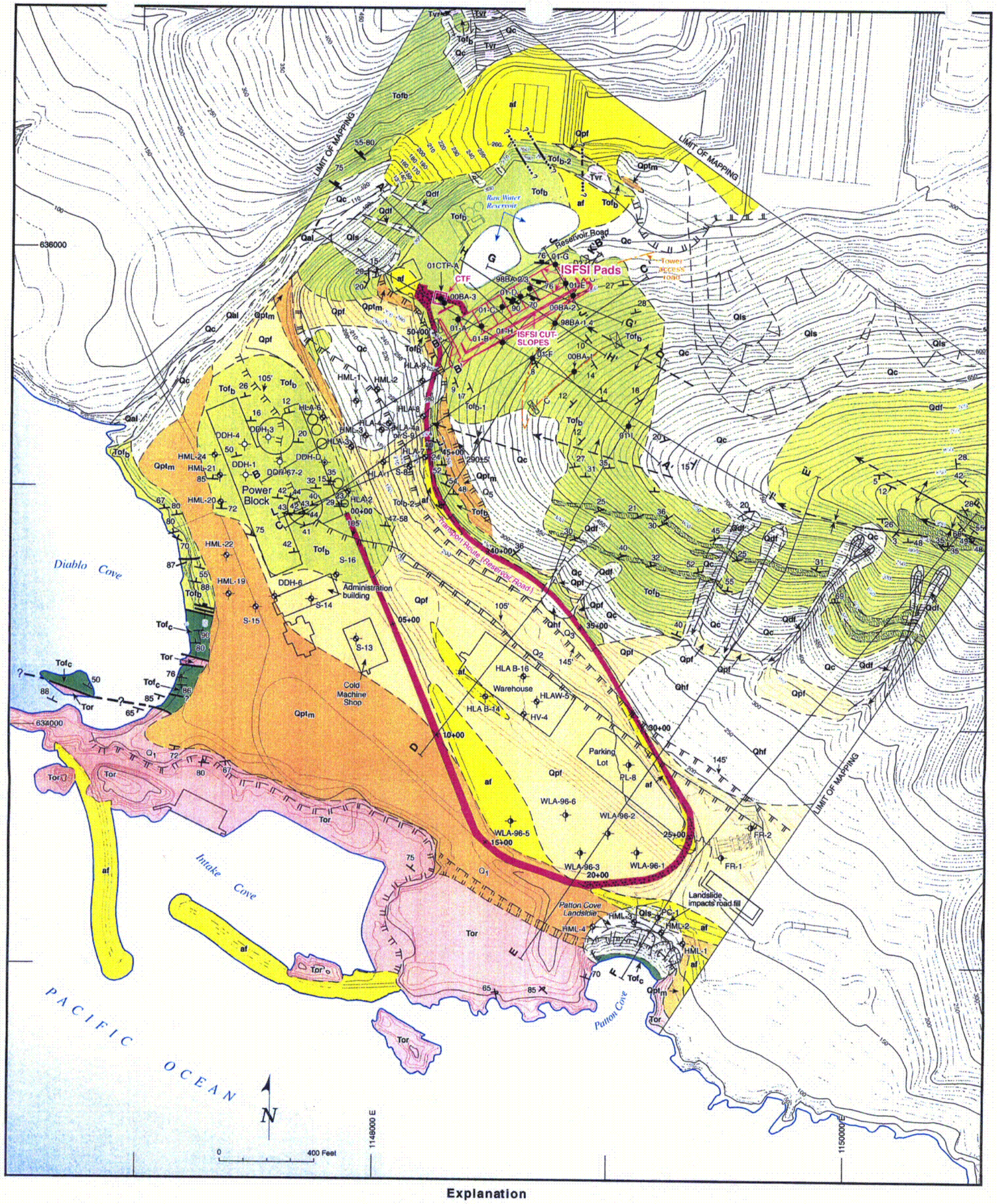
NOTE: The base topography for this map is a compilation of four different topographic maps: (1) the 1:2,400-scale Towill Corporation map based on 1966 aerial photography; (2) the 1986, 1:2,400-scale PG&E Plot Plan map; (3) 1970s era, 1:240-scale PG&E topographic/civil maps ("20-scale civil drawings"); and (4) the 2000-2001, 1:600 scale ISFSI Site map. These maps were merged and edited to eliminate map border conflicts and registered to the California State Coordinate System. Some of the maps listed above were received from PG&E Geoscience Department under letter of transmittal dated October 26, 2001 (PG&E Geosciences, 2001b).

DIABLO CANYON ISFSI

FIGURE 21-3
GEOLOGIC MAP OF THE ISFSI STUDY AREA AND TRANSPORT ROUTE VICINITY

GEO.DCPP.01.21 REV 2

December, 2001



Explanation

Quaternary

- af — Artificial fill (engineered)
- Qal, Qdf, Qc, Qls, Qhf — Quaternary deposits - alluvium, debris flow, colluvium, landslide, Holocene colluvial fan
  - NOTE: Only surficial deposits greater than about 5 feet thick shown
- Qpf — Pleistocene colluvial fan
- Qptm — Pleistocene marine terrace deposit (inferred)

Tertiary

- Tvr — Volcanic rock (middle Miocene), diabase intrusive sills and dikes
- *Obispo Formation (lower and middle Miocene)*
- Tofb — Member Tof, Unit b - dolomite, dolomitic siltstone, dolomitic sandstone, and sandstone, medium to thick bedded. (Prominent outcrops)
- Tofc — Member Tof, Unit c - shale, claystone and siltstone, thin to medium bedding, extensively sheared.
- Tor — Member Tor - volcanic rock, zeolitized and silicified tuff

Geologic contact, solid line where well-defined, dashed where approximate, queried where uncertain.

Fault, dashed where approximate, queried where uncertain

Landslides, arrows indicate direction of movement, hachures define headscarp region

Qdf — Debris flow path

Axis of syncline, larger arrow shows plunge, dashed where approximate

Axis of anticline, larger arrow shows plunge, dashed where approximate

Axis of monocline, larger arrow shows plunge, dashed where approximate

290' Q2 — Buried shoreline, angle of marine terrace wave cut platform; number and elevation indicated

Footprint of 500-kV tower

85 — Strike and dip of fault

10 — Strike and dip of bedding

85 — Overturned bedding

Horizontal bedding

Boring from 1967 power block study

1977 boring DDH-D at power block

Boring from previous HLA and HML studies

Boring for ISFSI investigations, WLA 1998 to 2001

Boring for ISFSI siting investigations, WLA 1996 to 1998

Transport route; stippled where transport route will be underlain by new engineered fill

B — B' Geologic cross section

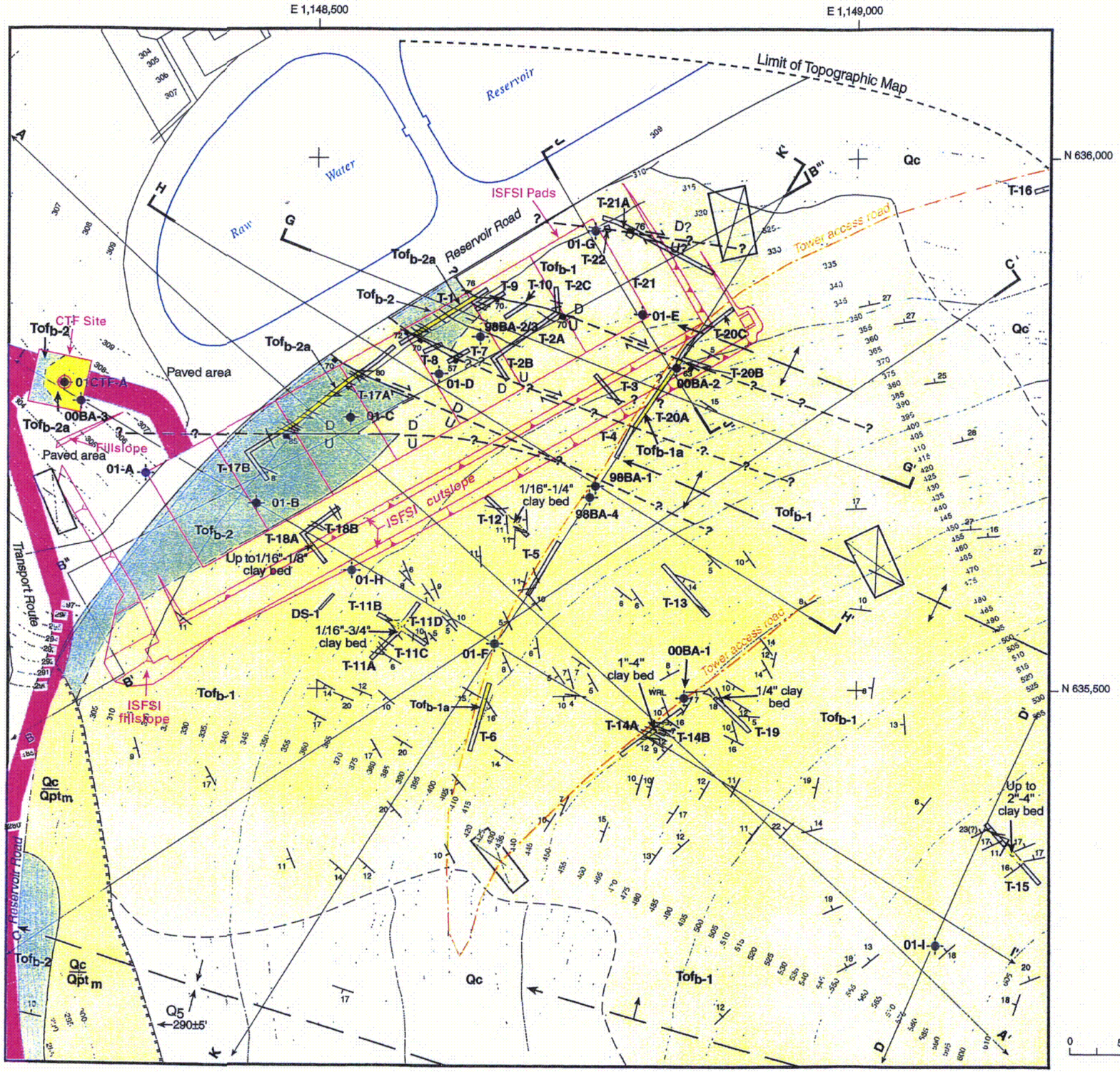
NOTE: The base topography for this map is a compilation of four different topographic maps: (1) the 1:2,400-scale Towill Corporation map based on 1966 aerial photography; (2) the 1986, 1:2,400-scale PG&E Plot Plan map; (3) 1970s era, 1:240-scale PG&E topographic/civil maps ("20-scale civil drawings"); and (4) the 2000-2001, 1:600 scale ISFSI Site map. These maps were merged and edited to eliminate map border conflicts and registered to the California State Coordinate System. Some of the maps listed above were received from PG&E Geoscience Department under letter of transmittal dated October 26, 2001 (PG&E Geosciences, 2001b).

DIABLO CANYON ISFSI

FIGURE 21-3
GEOLOGIC MAP OF THE ISFSI STUDY AREA AND TRANSPORT ROUTE VICINITY

GEO.DCPP.01.21 REV 2 — December, 2001

C04



EXPLANATION

Qc Colluvium

Qpt$_m$ Marine terrace deposit (overlain by Qc)

Obispo Formation (lower and middle Miocene)

DOLOMITE UNIT

Tofb-1 Dolomite, clayey dolomite, dolomitic siltstone to fine-grained dolomitic sandstone, and limestone. The unit contains occasional discontinuous to continuous (tens to hundreds of feet) clay beds that are generally 1/32- to 1/2-inch thick, but locally are thicker. Rocks in this unit are moderately to well cemented, moderately hard to hard, moderately to slightly weathered, brittle and typically medium strong.

Tofb-1a Friable dolomite and dolomitic siltstone of unit Tofb-1. These rocks typically have low hardness, are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

SANDSTONE UNIT

Tofb-2 Fine to coarse-grained dolomitic sandstone and sandstone (arkosic to arenitic) with lesser dolomite beds. Detrital clasts are composed primarily of dolomitized feldspars, marine fossil fragments, and volcanic rock fragments. Discontinuous clay beds that are generally less than 1/2-inch thick occur locally within the unit. The rocks are of low to medium hardness, moderately to well cemented and typically medium strong.

Tofb-2a Friable sandstone of unit Tofb-2. These rocks typically are of low hardness are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

6 — Strike and dip of bedding

U D 80 — Minor fault, dip indicated, dashed where inferred, queried where uncertain, arrows show relative sense of displacement, U-upthrown, D-downthrown

Small, secondary faults exposed in trench

1/16" — Clay bed, thickness indicated

Geologic contact, solid line where well-defined, dashed where approximate

O1-C — Boring for ISFSI, number indicated (initial number is year drilled, e.g. 01 was drilled in 2001)

A — A' — Geologic cross section, arrows indicate end of line is off the map area

T-4 — Exploratory trench, number indicated

DS-1 — Discontinuity survey line in bulldozer cut

Footprint of 500-kV tower

Cutslope above and fill prism west of ISFSI pads

Axis of anticline, larger arrow shows plunge, dashed where approximate

Axis of syncline, larger arrow shows plunge, dashed where approximate

Axis of monocline, larger arrow shows plunge, dashed where approximate

Q5 290±5' — Buried shoreline angle of marine terrace wave-cut platform, number and elevation indicated

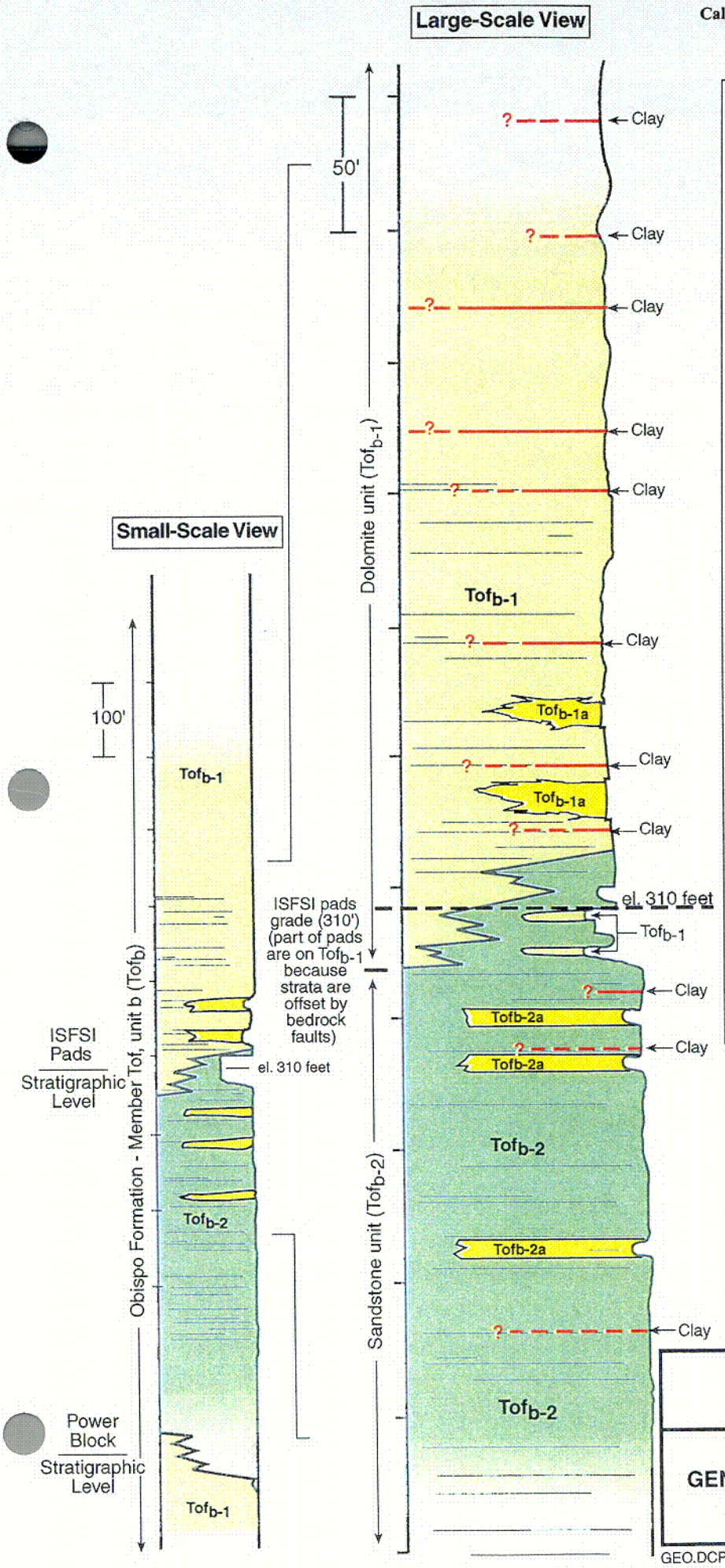
Note: ISFSI geometry is based on PG&E Enercon Drwg. Base map from No. PGE-009-sk-001 dated 9/27/01.

Geology not shown in paved area and reservoir area.

C05

DIABLO CANYON ISFSI

FIGURE 21-4
GEOLOGIC MAP OF ISFSI AND CTF SITES



Explanation

(Informal subunits of unit Tof_b of Obispo Formation)

DOLOMITE SUBUNIT

Tof_{b-1} — Dolomite, clayey dolomite, dolomitic siltstone to fine-grained dolomitic sandstone, and limestone. The unit contains occasional discontinuous to continuous (tens to hundreds of feet) clay beds that are generally 1/32-to 1/2-inch thick, but locally are thicker. Rocks in this unit are moderately to well cemented, moderately hard to hard, moderately to slightly weathered, brittle and typically medium strong.

Tof_{b-1a} — Friable dolomite and dolomitic siltstone of unit Tof_{b-1}. These rocks typically have low hardness, are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

SANDSTONE SUBUNIT

Tof_{b-2} — Fine to coarse-grained dolomitic sandstone and sandstone (arkosic to arenitic) with lesser dolomite beds. Detrital clasts are composed primarily of dolomitized feldspars, marine fossil fragments, and volcanic rock fragments. Discontinuous clay beds that are generally less than 1/2-inch thick occur locally within the unit. The rocks are of low to medium hardness, moderately to well cemented and typically medium strong.

Tof_{b-2a} — Friable sandstone of unit Tof_{b-2}. These rocks typically are of low hardness and are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

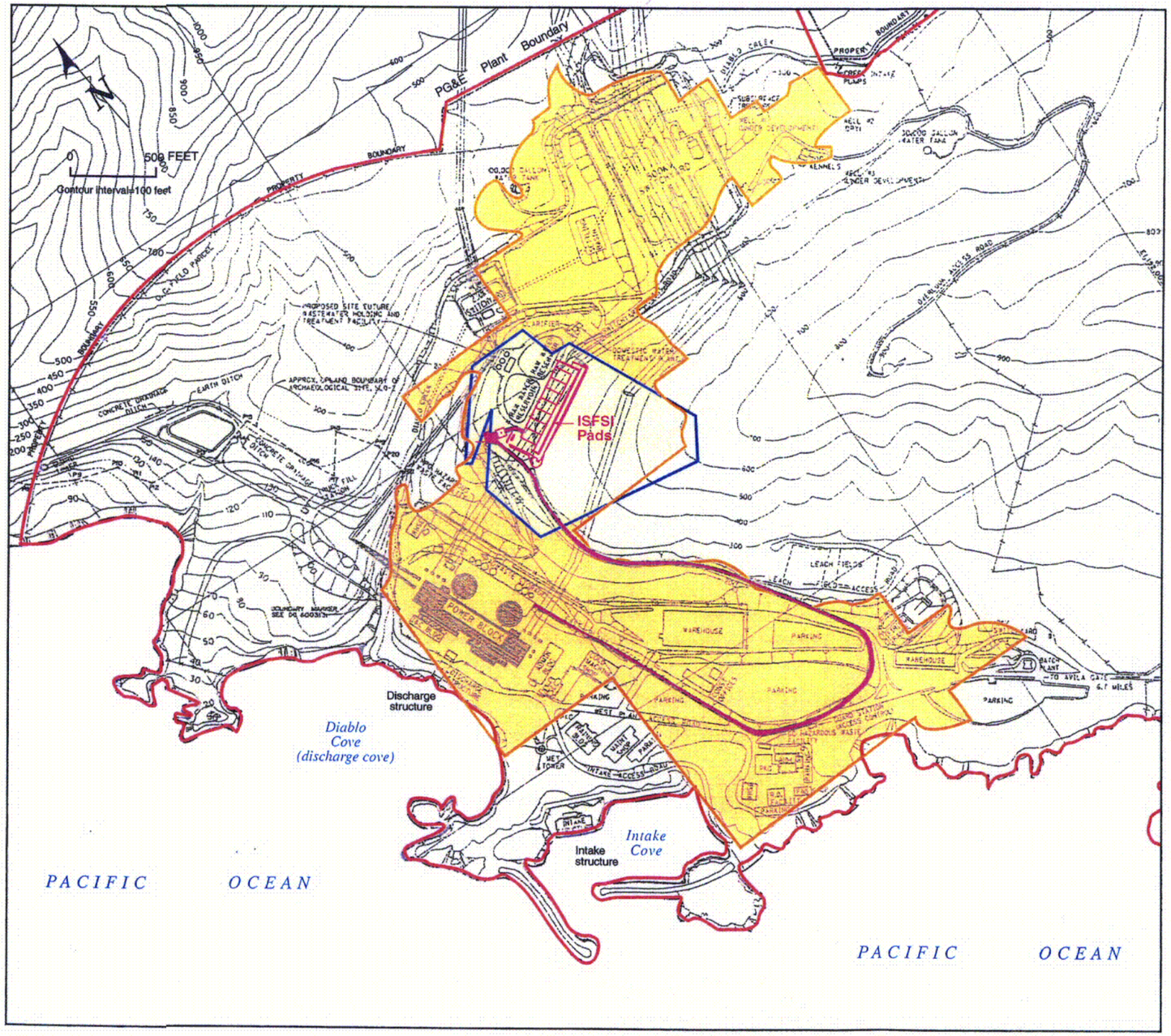
? — — — Clay bed; silty and sandy, tan to brown, some angular fragments within clay matrix, locally contains foraminifera, generally thin (1/16 to 1/2 inch). Clay beds more common and more laterally continuous in dolomite unit than in the sandstone unit.

C06

DIABLO CANYON ISFSI

FIGURE 21-5
GENERALIZED STRATIGRAPHIC COLUMN AT THE ISFSI AND POWER BLOCK SITES

GEO.DCPP.01.21 REV 2 December, 2001



Explanation

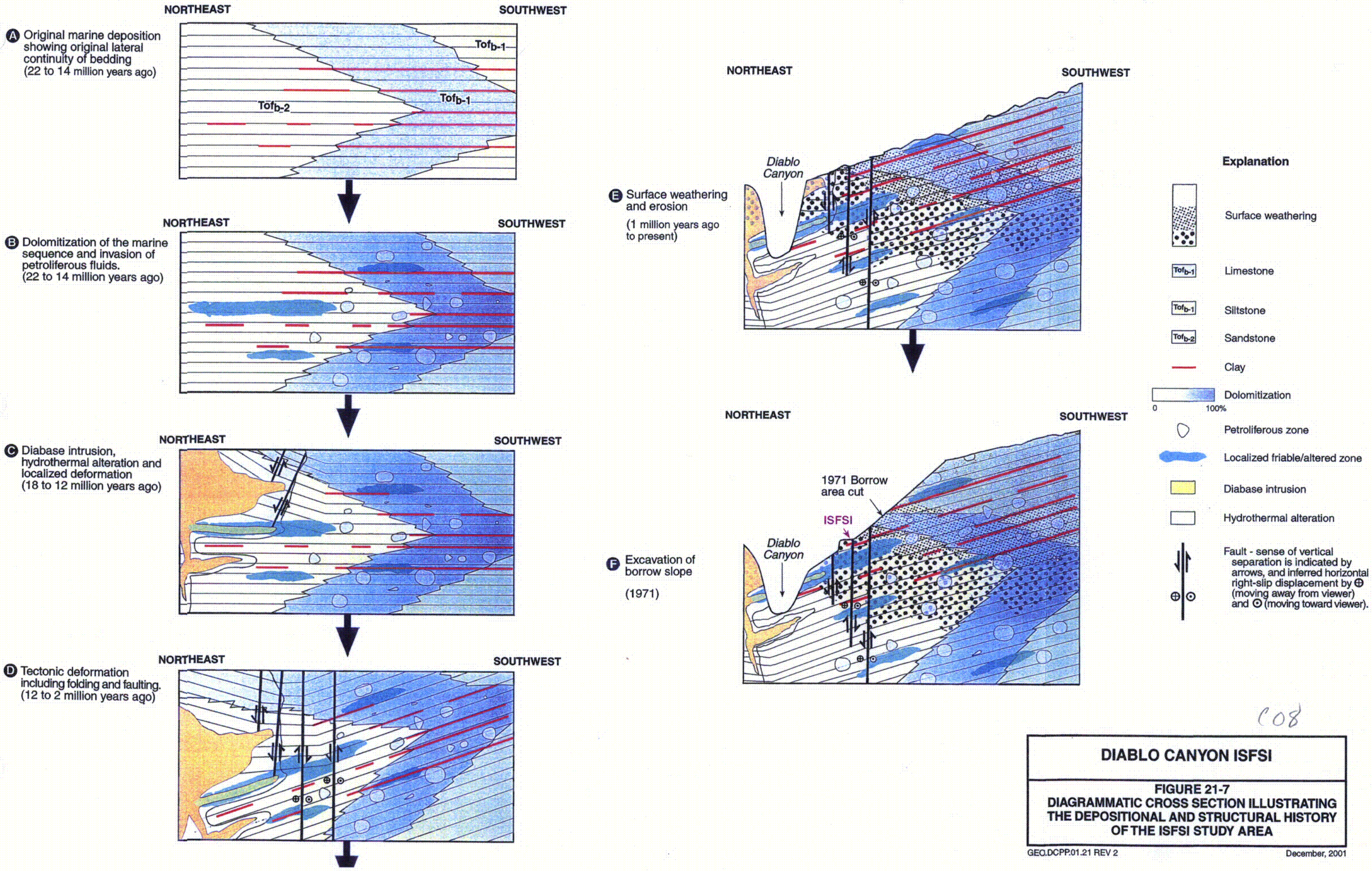
- 1966 (and later) Towill Corporation plant property topographic map, 1"=200'- scale, 10' contour interval
- 1998-2001 ISFSI Map, 1"=50'- scale, 1' to 5' contour interval
- 1968-1990's (various)-DCPP 20 Scale Civil Topographic drawings, 1"=20'- scale, 5-10' contour interval. Shading denotes area within map covered by topographic data used for the ISFSI project

C07

DIABLO CANYON ISFSI

FIGURE 21-6
INDEX MAP OF TOPOGRAPHIC SURVEYS

GEO.DCPP.01.21 REV 2 December, 2001

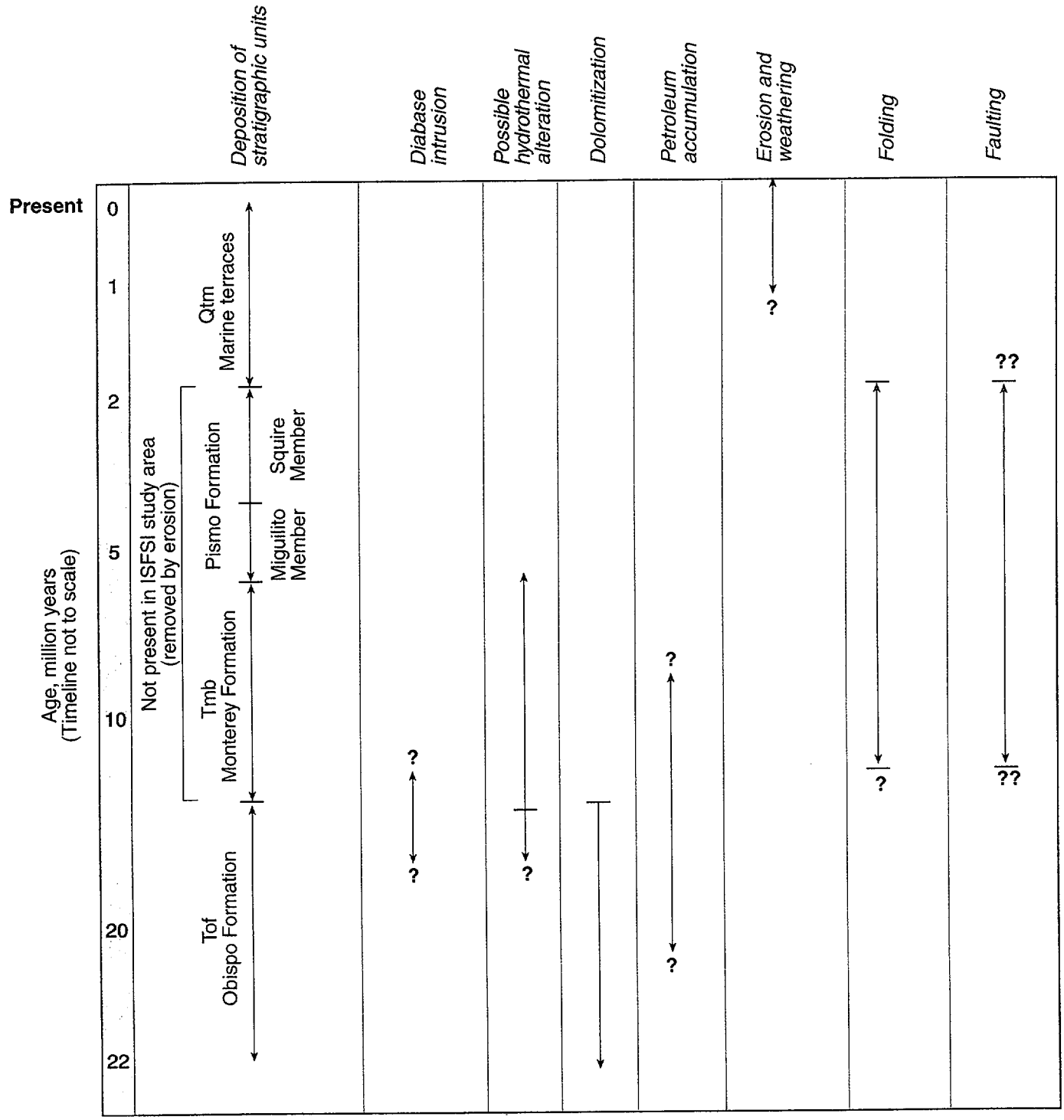


C08

DIABLO CANYON ISFSI

FIGURE 21-7
DIAGRAMMATIC CROSS SECTION ILLUSTRATING THE DEPOSITIONAL AND STRUCTURAL HISTORY OF THE ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2 December, 2001

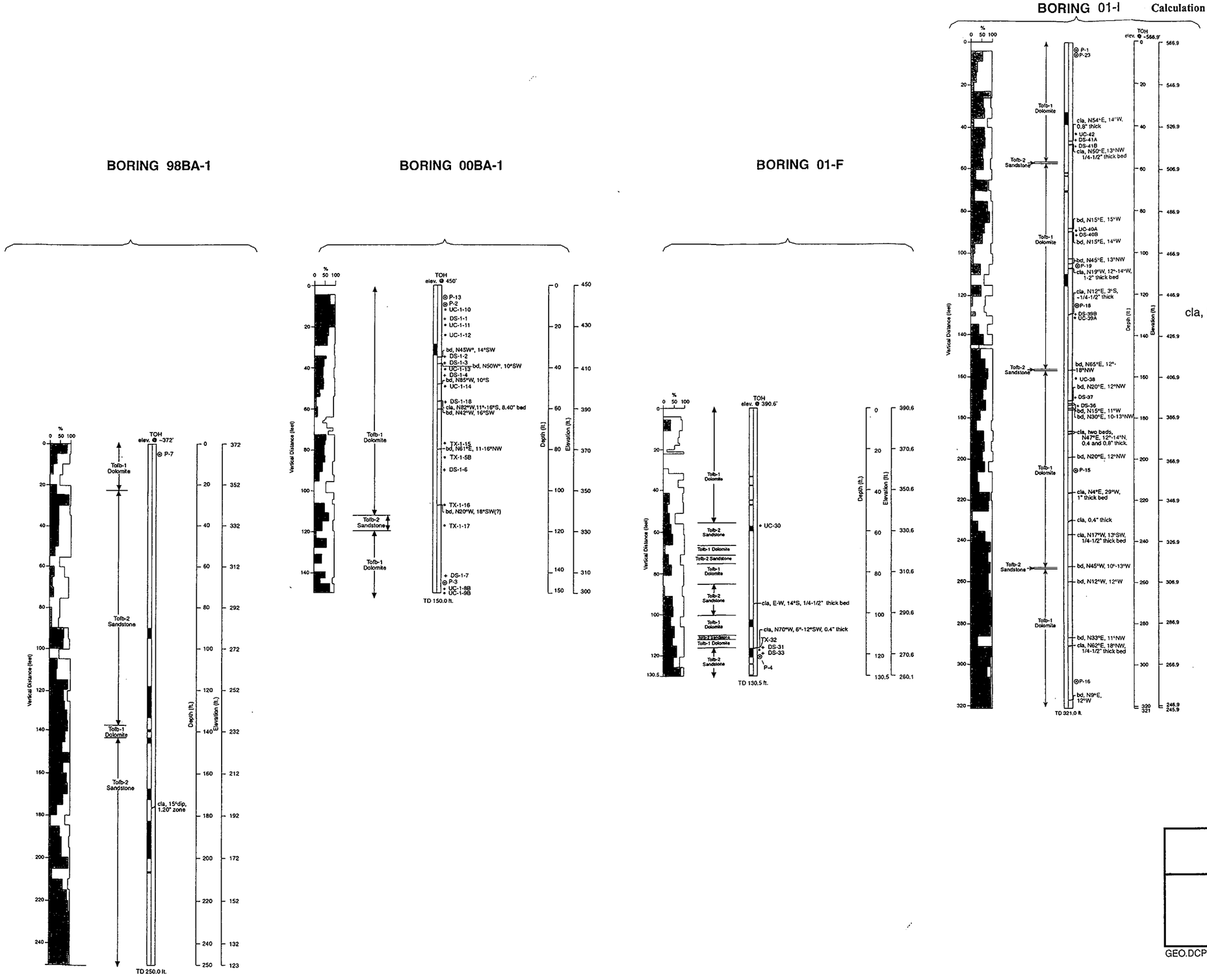


DIABLO CANYON ISFSI

FIGURE 21-8
CHRONOLOGY OF STRATIGRAPHY AND GEOLOGIC PROCESSES AT THE ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2

December, 2001



Explanation

⊙ P-x	Petrographic sample location
• UC-x	Unconfined test sample location
• Tx-x	Triaxial test sample location
+ DS-x	Direct shear test sample location
cla, N22°W, 25°S, 1/2"	Clay bed, with strike, dip, and thickness (where known) (Table 21-3)
bd, N61°W, 16°S	Bedding, with strike, dip, and thickness (where known) (Table 21-1)
■	Friable (weak) dolomite or sandstone zones
	Percent recovery of core run
	Rock Quality Designation (Deere, and Miller, 1966) of core run; length of recovered intact core over 4 inches divided by length of core run. Low RQD is indicative of closely spaced joints, high RQD is indicative of moderate to widely spaced joints.

Note:1. Explanation is general. Not all features apply to every boring.

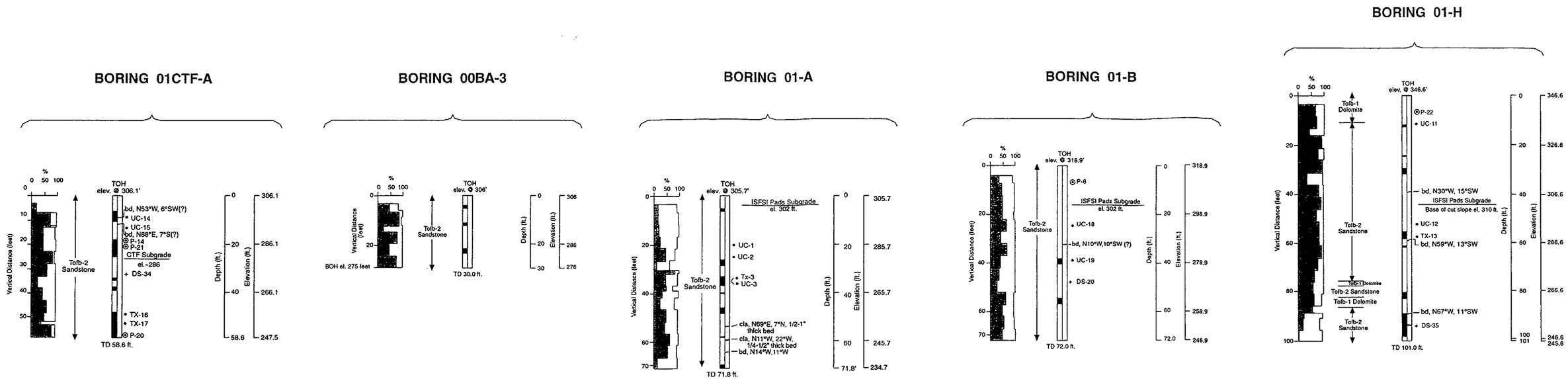
Note: 2. Only those claybeds that are greater than 1/4" thick are shown

Note: 3. Coring began 1' to 3' below grade level to allow for installation of borehole casing.

DIABLO CANYON ISFSI

FIGURE 21-9
SUMMARY LOGS OF BORINGS ON SLOPE ABOVE ISFSI SITE

GEO.DCPP.01.21 REV 2 December, 2001



Explanation

⊙ P-x	Petrographic sample location
• UC-x	Unconfined test sample location
• Tx-x	Triaxial test sample location
+ DS-x	Direct shear test sample location
cla, N22°W, 25°S, 1/2"	Clay bed, with strike, dip, and thickness (where known) (Table 21-3)
bd, N61°W, 16°S	Bedding, with strike, dip, and thickness (where known) (Table 21-1)
▮	Friable (weak) dolomite or sandstone zones
	Percent recovery of core run
	Rock Quality Designation (Deere, and Miller, 1966) of core run; length of recovered intact core over 4 inches divided by length of core run. Low RQD is indicative of closely spaced joints, high RQD is indicative of moderate to widely spaced joints.

Note: 1. Explanation is general. Not all features apply to every boring.

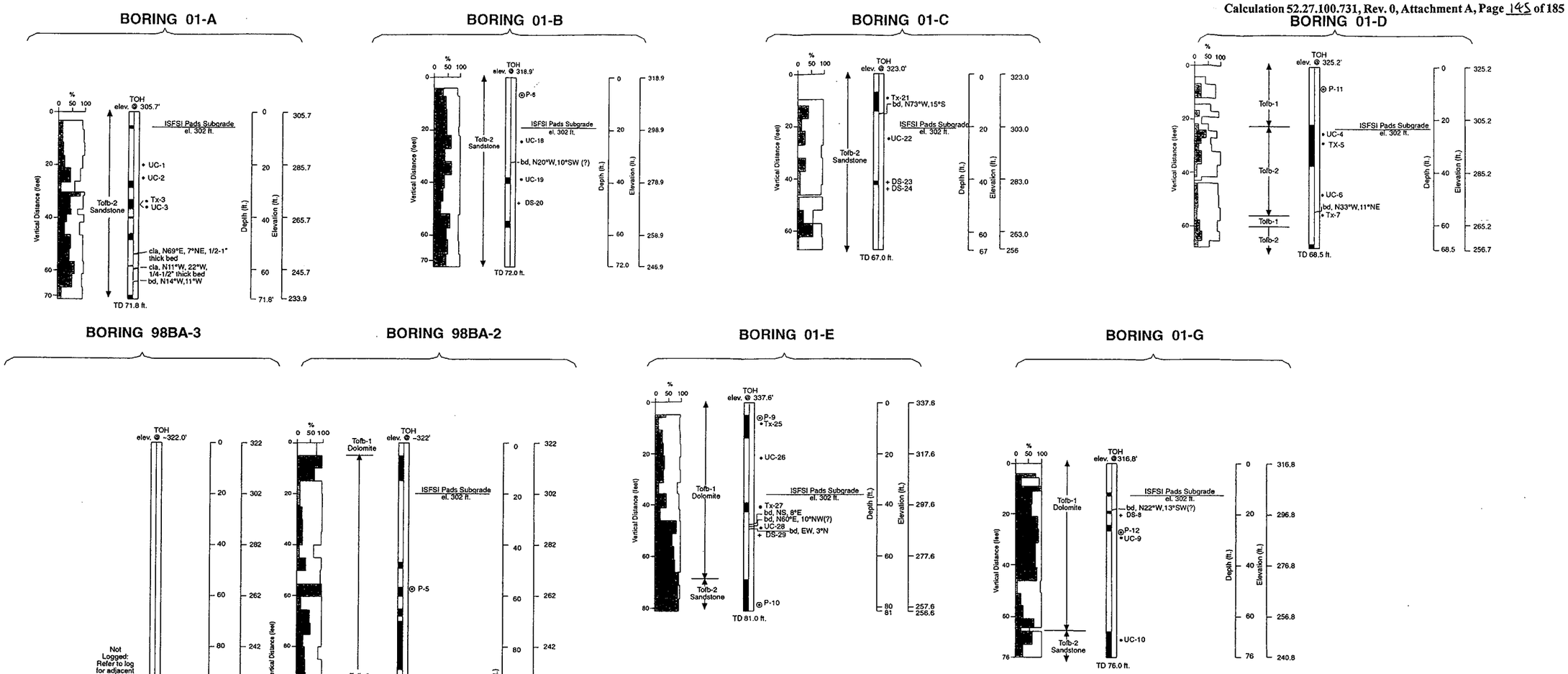
Note: 2. Only those claybeds that are greater than 1/4" thick are shown

Note: 3. Coring began 1' to 3' below grade level to allow for installation of borehole casing.

DIABLO CANYON ISFSI

FIGURE 21-10
SUMMARY LOGS OF BORINGS NEAR SOUTHWEST END OF ISFSI SITE

GEO.DCPP.01.21 REV 2 December, 2001



Explanation

⊙ P-x	Petrographic sample location
• UC-x	Unconfined test sample location
• Tx-x	Triaxial test sample location
+ DS-x	Direct shear test sample location
cla, N22°W, 25°S, 1/2"	Clay bed, with strike, dip, and thickness (where known) (Table 21-3)
bd, N61°W, 16°S	Bedding, with strike, dip, and thickness (where known) (Table 21-1)
▮	Friable (weak) dolomite or sandstone zones
	Percent recovery of core run
	Rock Quality Designation (Deere, and Miller, 1966) of core run; length of recovered intact core over 4 inches divided by length of core run. Low RQD is indicative of closely spaced joints, high RQD is indicative of moderate to widely spaced joints.

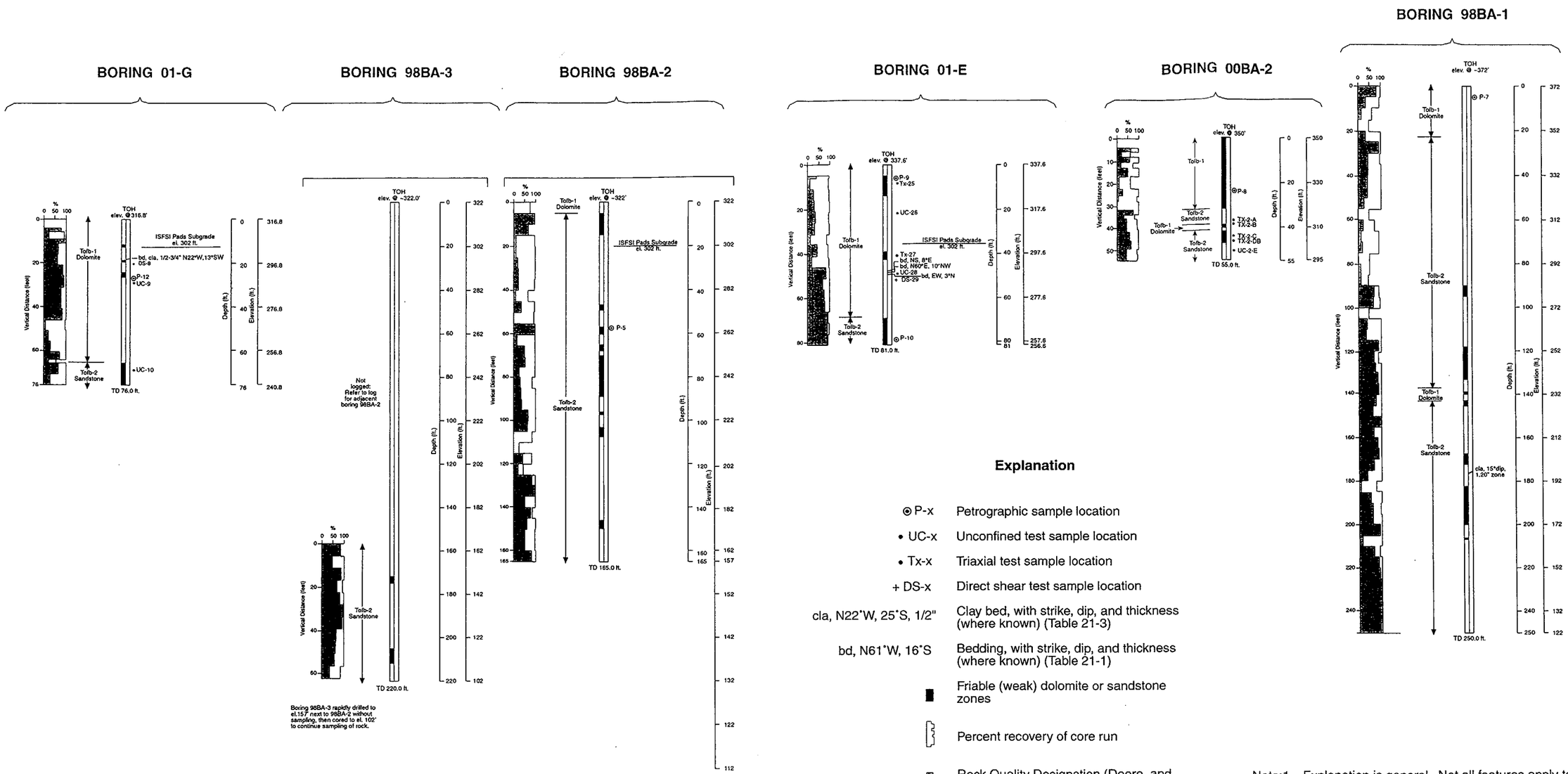
Note:1. Explanation is general. Not all features apply to every boring.

Note: 2. Only those claybeds that are greater than 1/4" thick are shown

Note: 3. Coring began 1' to 3' below grade level to allow for installation of borehole casing.

DIABLO CANYON ISFSI

FIGURE 21-11
SUMMARY LOGS OF BORINGS AT ISFSI SITE



Explanation

⊙ P-x	Petrographic sample location
• UC-x	Unconfined test sample location
• Tx-x	Triaxial test sample location
+ DS-x	Direct shear test sample location
cla, N22°W, 25°S, 1/2"	Clay bed, with strike, dip, and thickness (where known) (Table 21-3)
bd, N61°W, 16°S	Bedding, with strike, dip, and thickness (where known) (Table 21-1)
■	Friable (weak) dolomite or sandstone zones
	Percent recovery of core run
	Rock Quality Designation (Deere, and Miller, 1966) of core run; length of recovered intact core over 4 inches divided by length of core run. Low RQD is indicative of closely spaced joints, high RQD is indicative of moderate to widely spaced joints.

Note: 1. Explanation is general. Not all features apply to every boring.

Note: 2. Only those claybeds that are greater than 1/4" thick are shown

Note: 3. Coring began 1' to 3' below grade level to allow for installation of borehole casing.

DIABLO CANYON ISFSI

FIGURE 21-12
SUMMARY LOGS OF BORINGS NEAR EAST END OF ISFSI SITE

Explanation

Geology

Quaternary

- **af** — Artificial fill (engineered)
- **Qal, Qdf, Qc, Qls, Qhf** — Quaternary deposits - alluvium (Qal), debris flow (Qdf), colluvium (Qc), landslide (Qls), Holocene colluvial fan (Qhf)
- **Qpf** — Pleistocene colluvial fan
- **Qptm** — Pleistocene marine terrace deposit (inferred)

Tertiary

- **Tvr** — Volcanic rock (middle Miocene), diabase intrusive sills and dikes

Obispo Formation (lower and middle Miocene)

- **Tofb** — Member Tof, unit b - dolomite, dolomitic siltstone, dolomitic sandstone, and sandstone: medium to thick bedding
- **Tofc** — Member Tof, unit c - shale, claystone and siltstone, thin to medium bedding, extensively sheared
- **Tor** — Member Tor - volcanic rock, zeolitized and silicified tuff

DOLOMITE SUBUNIT

- **Tofb-1** — Dolomite, clayey dolomite, dolomitic siltstone to fine-grained dolomitic sandstone, and limestone. The unit contains occasional discontinuous to continuous (tens to hundreds of feet) clay beds that are generally 1/32- to 1/2-inch thick, but locally are thicker. Rocks in this unit are moderately to well cemented, moderately hard to hard, moderately to slightly weathered, brittle and typically medium strong.
- **Tofb-1a** — Friable dolomite and dolomitic siltstone of unit Tofb-1. These rocks typically have low hardness, are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

SANDSTONE SUBUNIT

- **Tofb-2** — Fine to coarse-grained dolomitic sandstone and sandstone (arkosic to arenitic) with lesser dolomite beds. Detrital clasts are composed primarily of dolomitized feldspars, marine fossil fragments, and volcanic rock fragments. Discontinuous clay beds that are generally less than 1/2-inch thick occur locally within the unit. The rocks are of low to medium hardness, moderately to well cemented and typically medium strong.
- **Tofb-2a** — Friable sandstone of unit Tofb-2. These rocks typically are of low hardness, are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

Symbols

- Apparent dip of bedding
- Apparent dip of bedding measured in boring
- Bedding shown schematically and inferred from projection of nearby surface outcrops or borehole surveys
- ? Lithologic contact, inferred except where encountered in boreholes and surface mapping, queried where uncertain
- Fault - location based on projection of trench or surface exposure. Vertical projection is inferred. Dip of fault assumed to be vertical unless well constrained by multiple surface attitudes. Queried where uncertain. Sense of vertical separation is indicated by arrows and inferred horizontal right-slip displacement by ⊕ (moving away from viewer) and ⊙ (moving toward viewer).
- Clay, silty and sandy, tan to brown, some angular fragments within clay matrix, locally contains foraminifera, generally thin (1/16 to 1/2 inch). Clay beds more common and more laterally continuous in dolomite unit than in the sandstone unit.
- <1/8", 1/8"-1/4", >1/4" — Clay bed - weight of solid line indicates bed thickness where encountered in borings or trenches, dashed line where inferred (no thickness indicated); queried where uncertain, clay beds projected beyond borings or trenches based on thickness (>1/4-inch thick beds projected 100 feet as solid line and 100 feet as dashed line, 1/8-inch to 1/4-inch thick beds projected 50 feet solid and 50 feet dashed, <1/8-inch thick beds projected 25 feet solid and 25 feet dashed) unless constrained to be shorter on adjoining boreholes and trenches.
- 01-H, TD 30.5 ft. — Exploration boring, number (01-H, initial number indicates year drilled) and depth (TD 30.5 feet) indicated
- T-18 — Exploration trench, number indicated; trenches are shown open if they cross section line, filled if projected into section line
- Groundwater elevation and date of measurement indicated

*Pleistocene Marine Terraces Designation**

- Q_1 Oxygen Isotope Stage 5a marine terrace (80,000 years old)
- Q_2 Oxygen Isotope Stage 5e marine terrace (120,000 years old)
- Q_3 Oxygen Isotope Stage 7 marine terrace (210,000 years old)
- Q_4 Oxygen Isotope Stage 9 marine terrace (330,000 years old)
- Q_5 Oxygen Isotope Stage 11 marine terrace (430,000 years old)

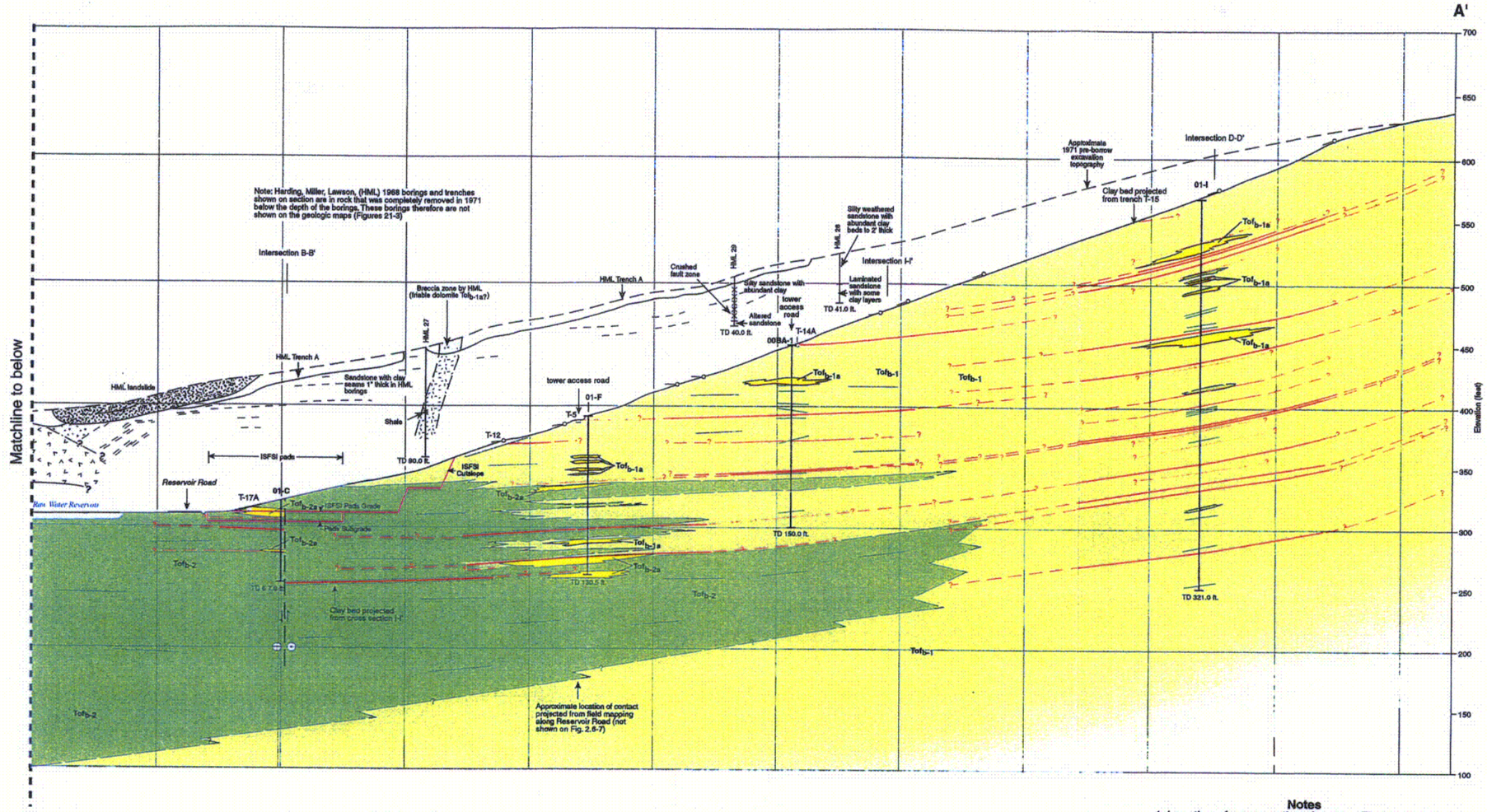
* *Ages and correlation of marine terraces based on K.L., Hansen, J.R. Wesling, W.R. Lettis, K.I. Kelson and L. Mezger, 1994. Correlation, ages, and uplift rates of Quaternary marine terraces, in Alterman, I.B., McMullen, R.B., Cluff, L.S., and Slemmons, D.B., eds., Seismotectonics of the Central California Coast Ranges: Boulder, Colorado, Geological Society of America Special Paper 292.*

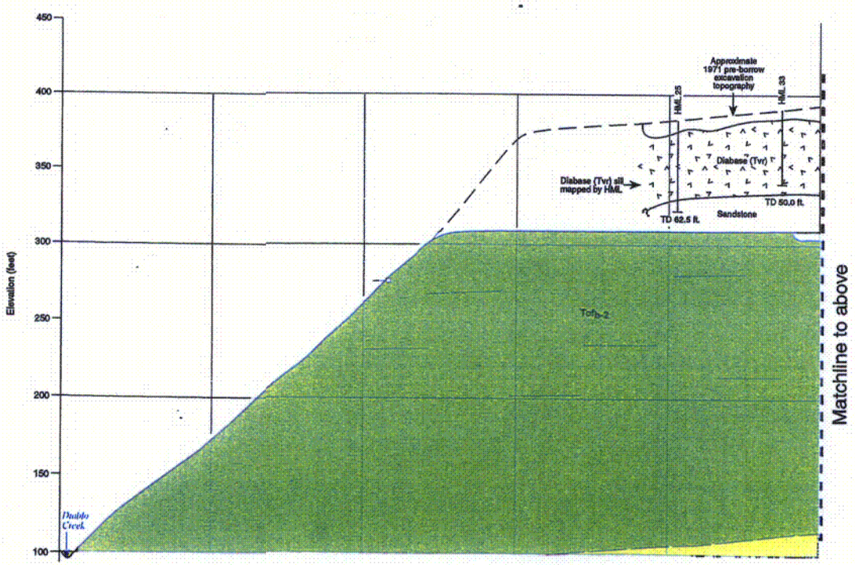
C09

DIABLO CANYON ISFSI

FIGURE 21-13
EXPLANATION FOR CROSS SECTIONS

GEO.DCPP.01.21 REV 2 December, 2001





Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

C10

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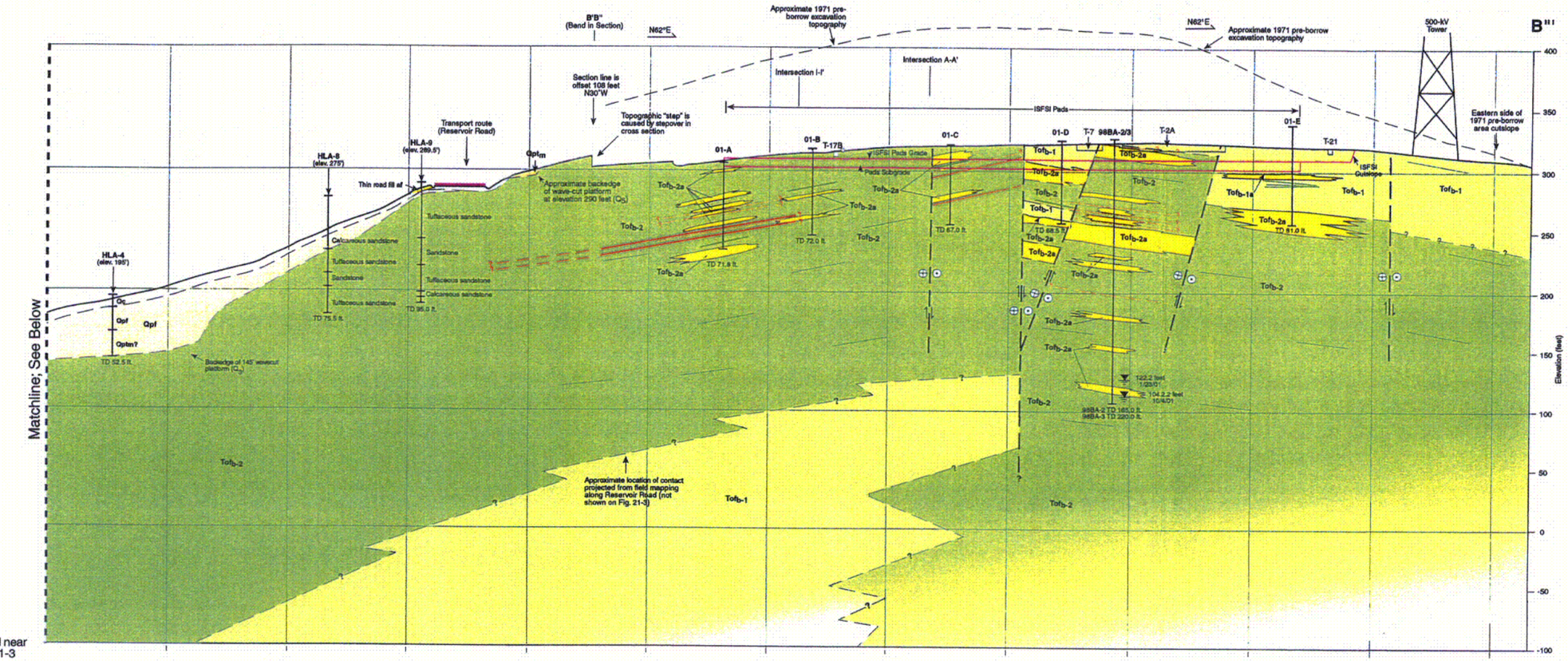
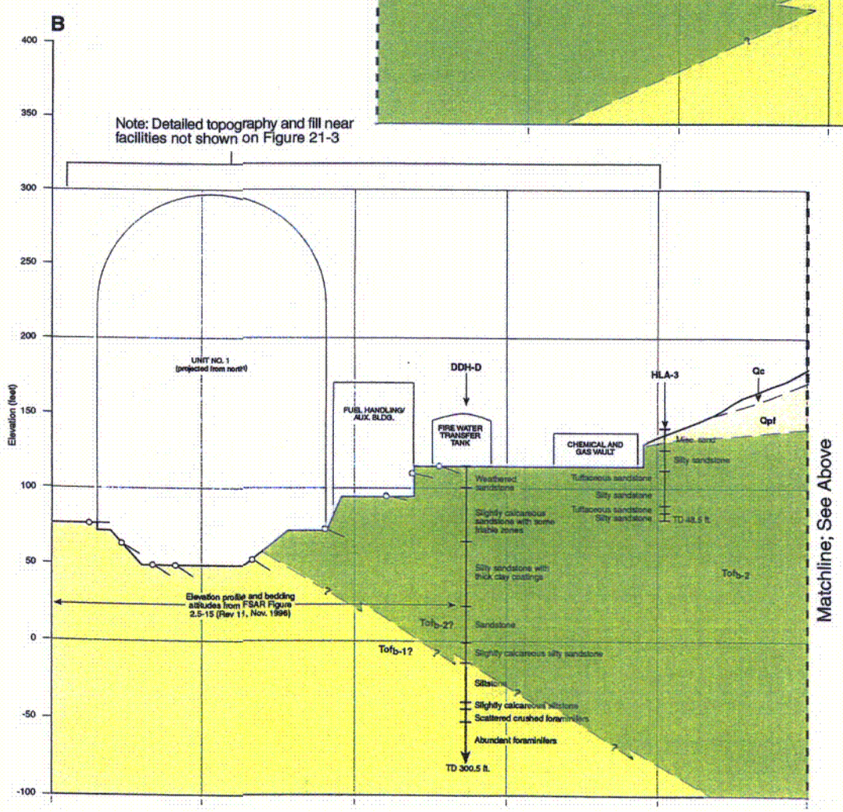
FIGURE 21-14
CROSS SECTION A-A'

GEO.DCPP.01.21 REV 2 December, 2001





Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

C11

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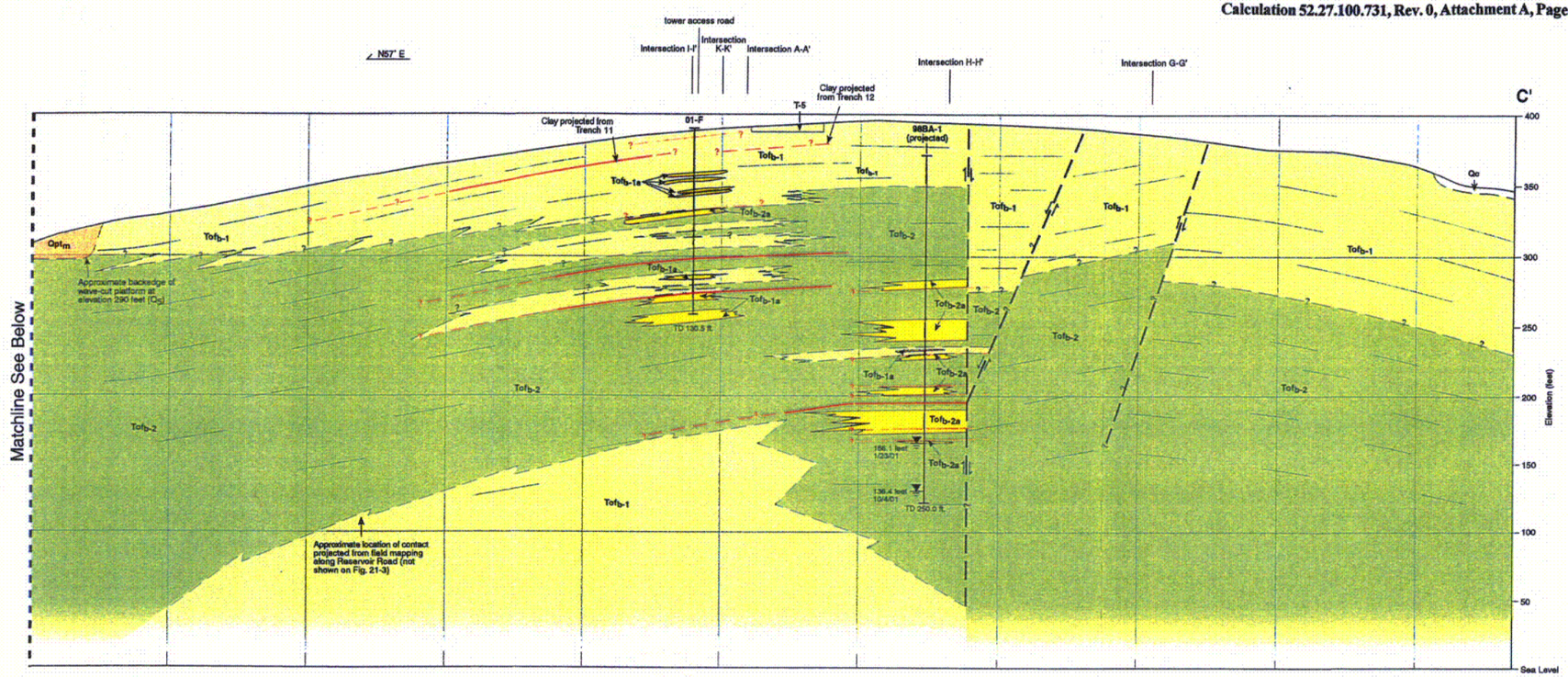
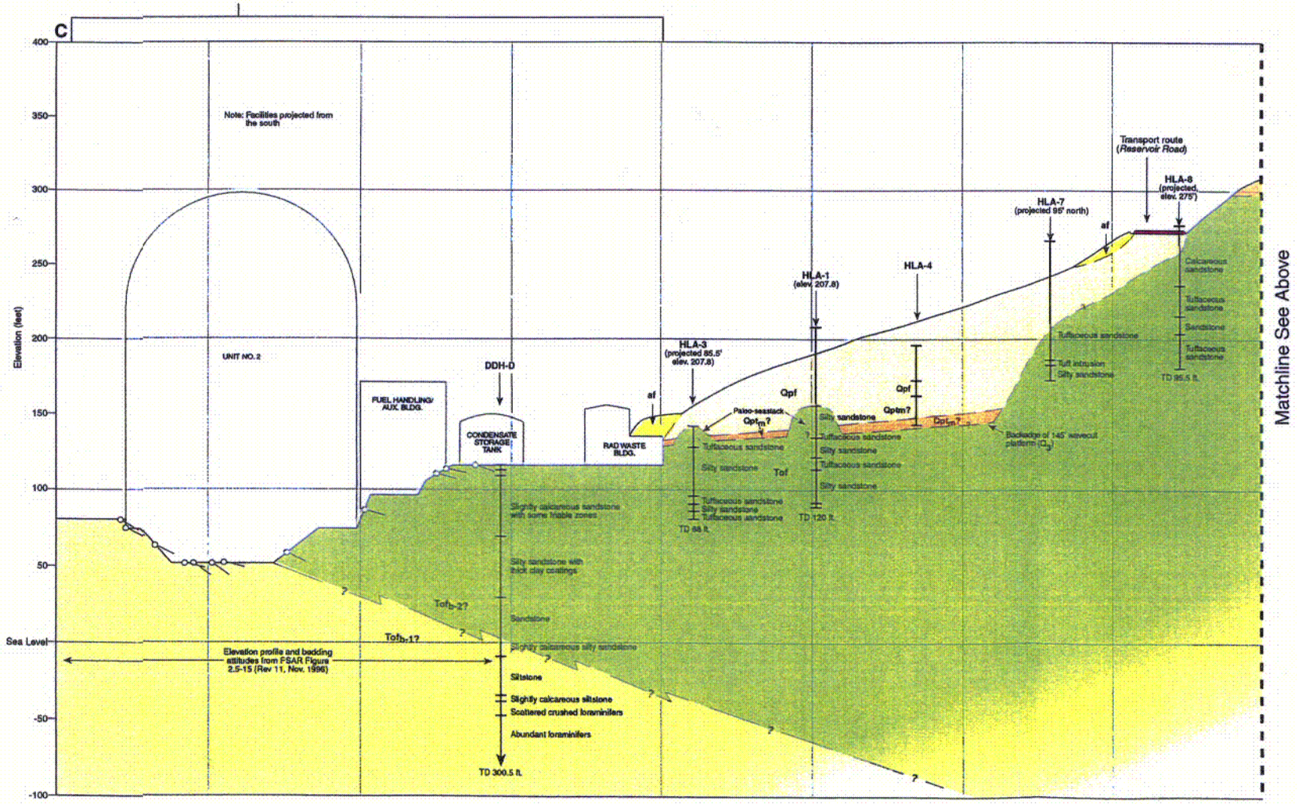
FIGURE 21-15
CROSS SECTION B-B'''

GEO.DCPP.01.21 REV 2 December, 2001



Note: Detailed topography and fill near facilities not shown on Figure 21-3



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

0 25 50 75 100 feet
Scale

C12

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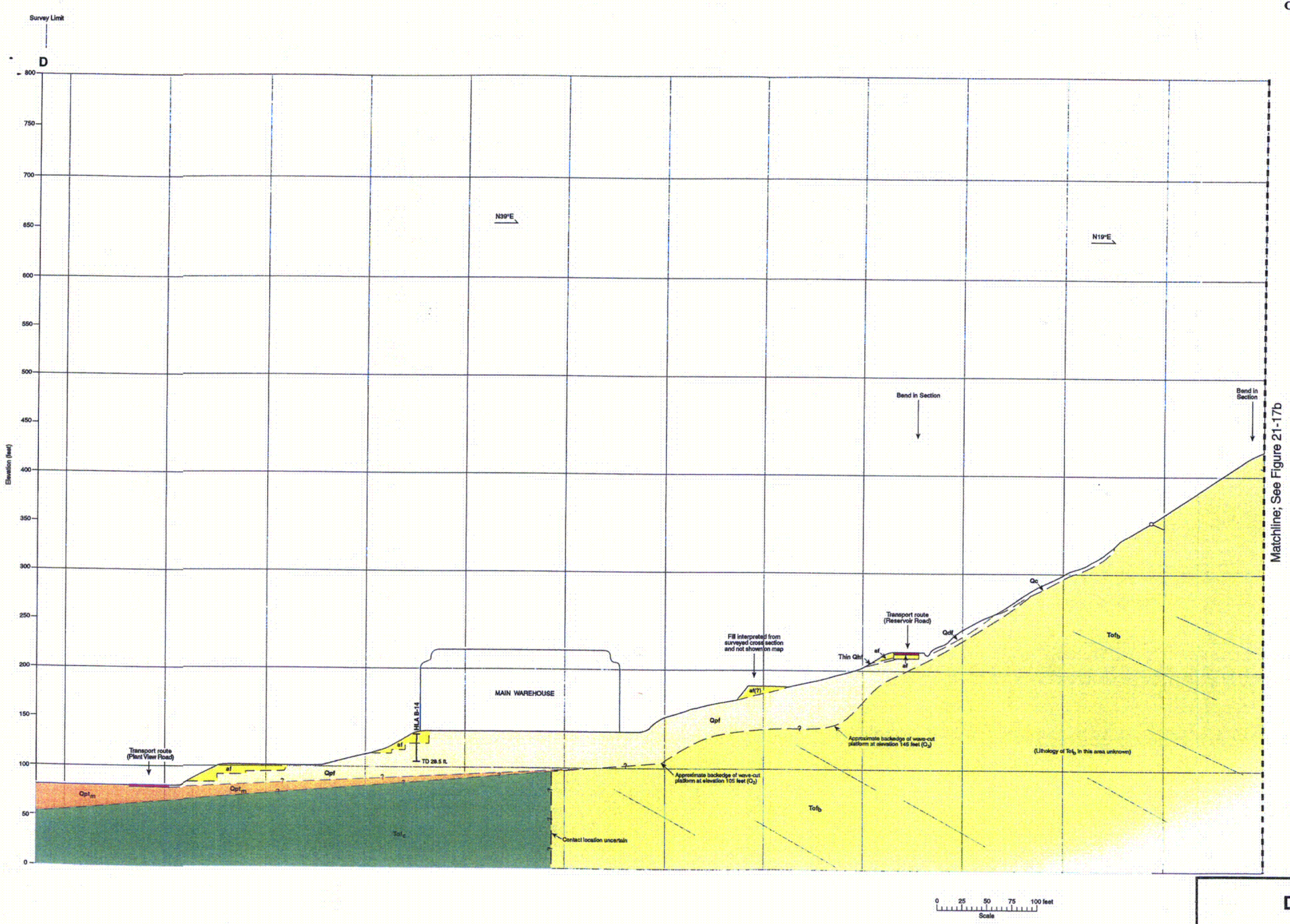
FIGURE 21-16
CROSS SECTION C-C'

GEO.DCPP.01.21 REV 2 December, 2001



C13

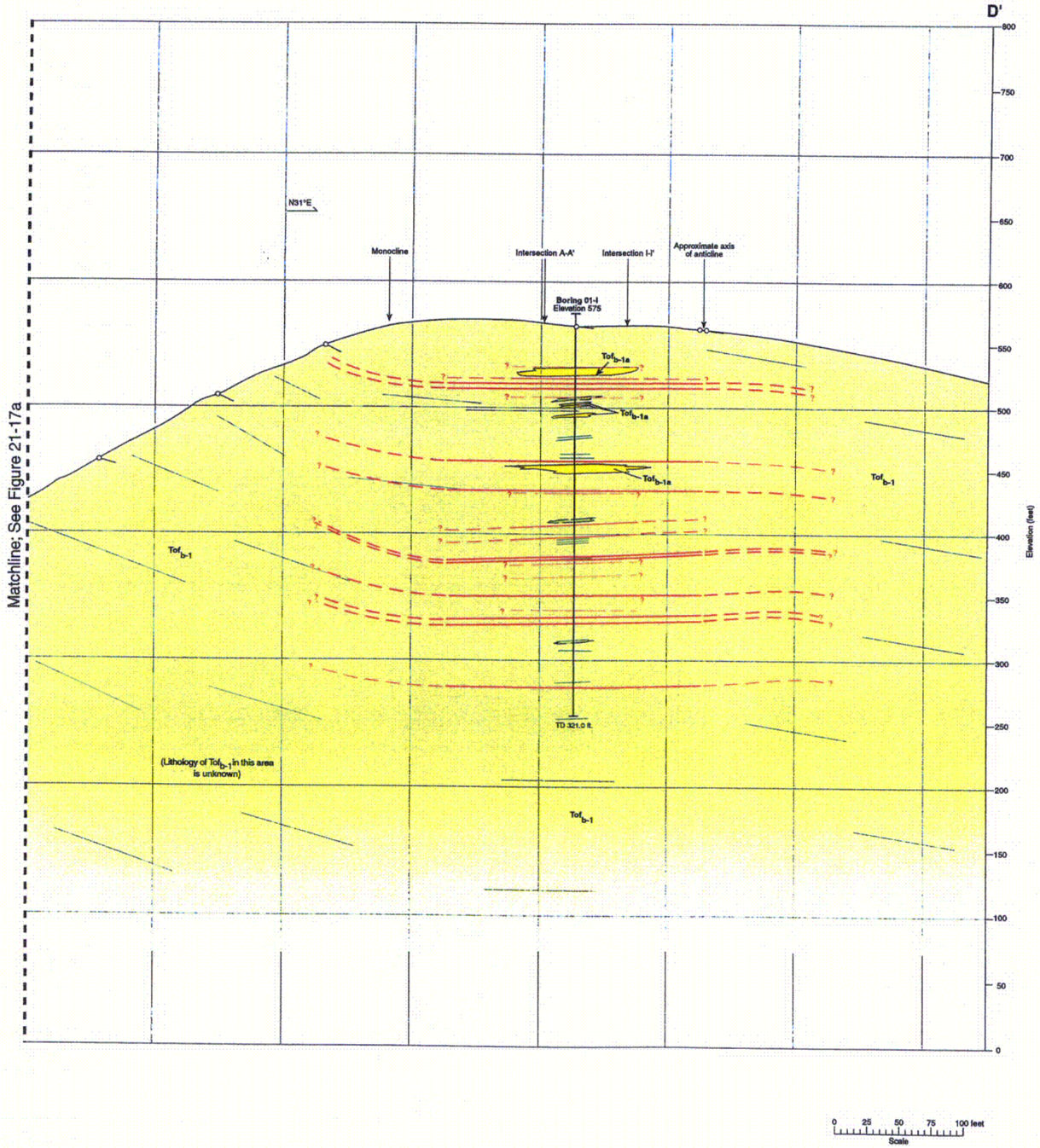
Notes

1. Location of cross section shown on Figures 2.6-7 and 2.6-8. Nearby borings are projected to cross section.
2. See Figure 2.6-9 for explanation of geologic units.
3. Horizontal scale = vertical scale.

DIABLO CANYON ISFSI

FIGURE 21-17a
CROSS SECTION D-D'

GEO.DCPP.01.21 REV 2 December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

C14

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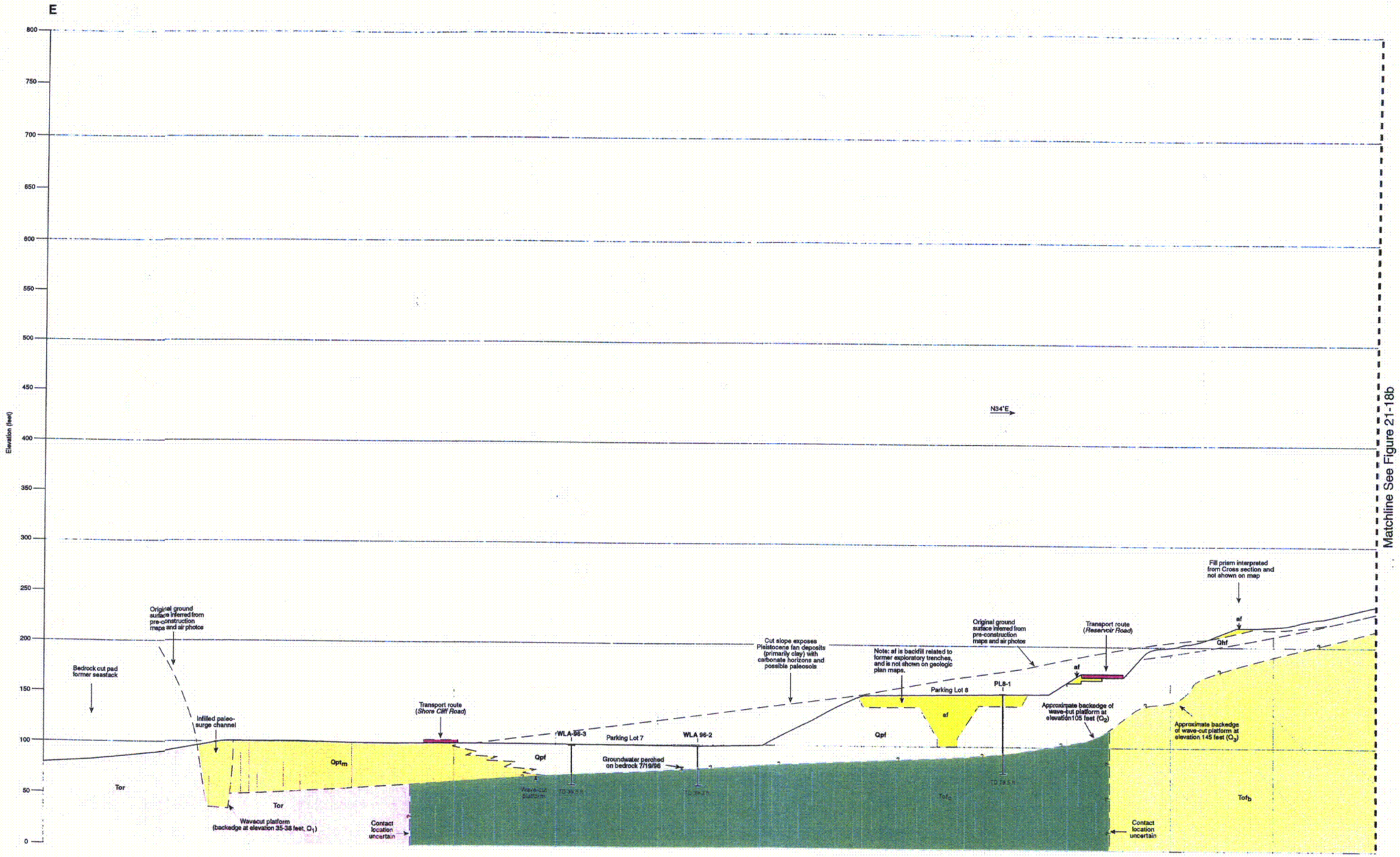
FIGURE 21-17b
CROSS SECTION D-D'

GEO.DCPP.01.21 REV 2 December, 2001



C15

Notes

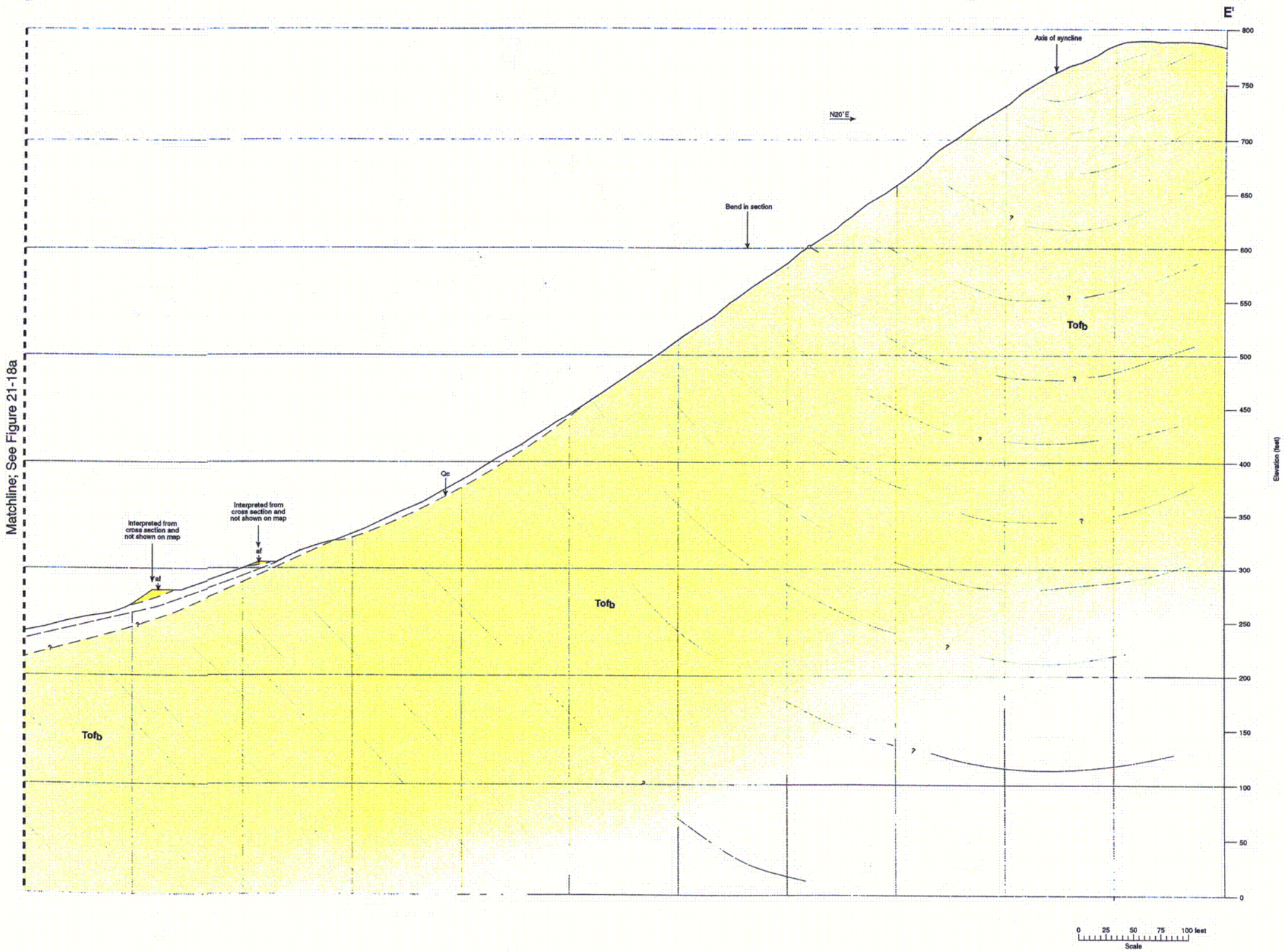
1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

0 25 50 75 100 feet
Scale

DIABLO CANYON ISFSI

FIGURE 21-18a
CROSS SECTION E-E'

GEO.DCPP.01.21 REV 2 December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

C16

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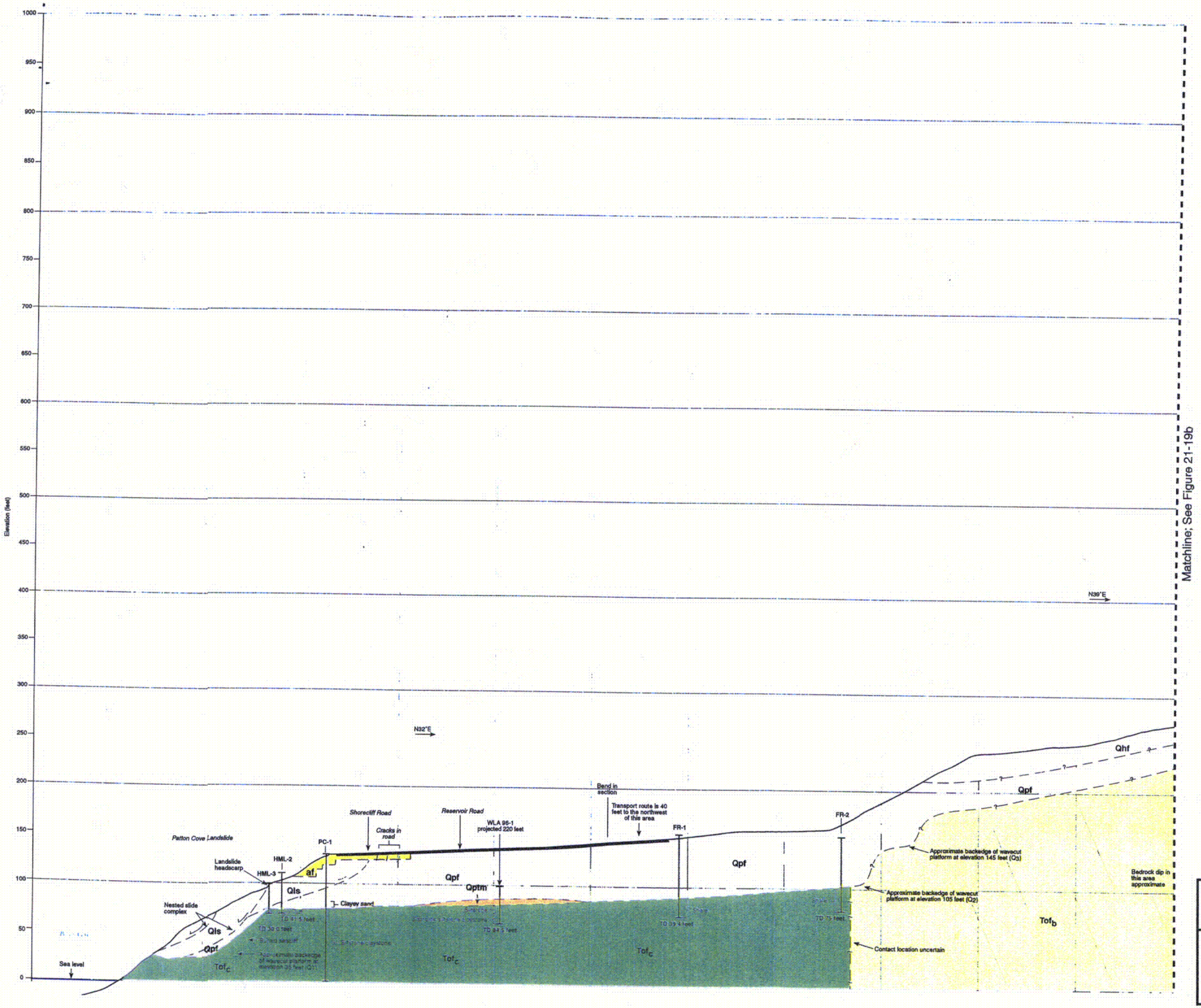
FIGURE 21-18b
CROSS SECTION E-E'

GEO.DCPP.01.21 REV 2 December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

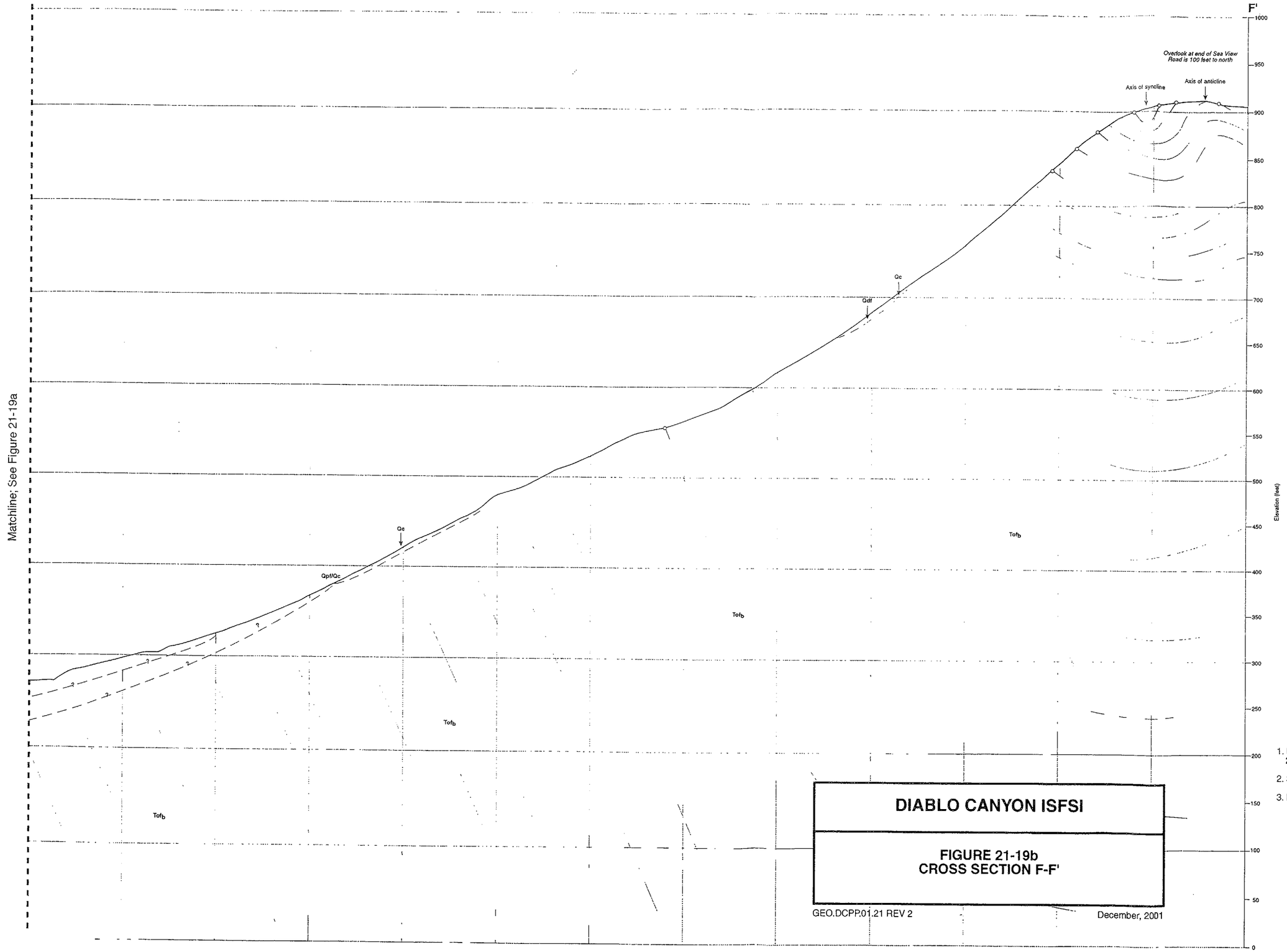
0 25 50 75 100 feet
Scale

C17

DIABLO CANYON ISFSI

FIGURE 21-19a
CROSS SECTION F-F'

GEO.DCPP.01.21 REV 2 December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

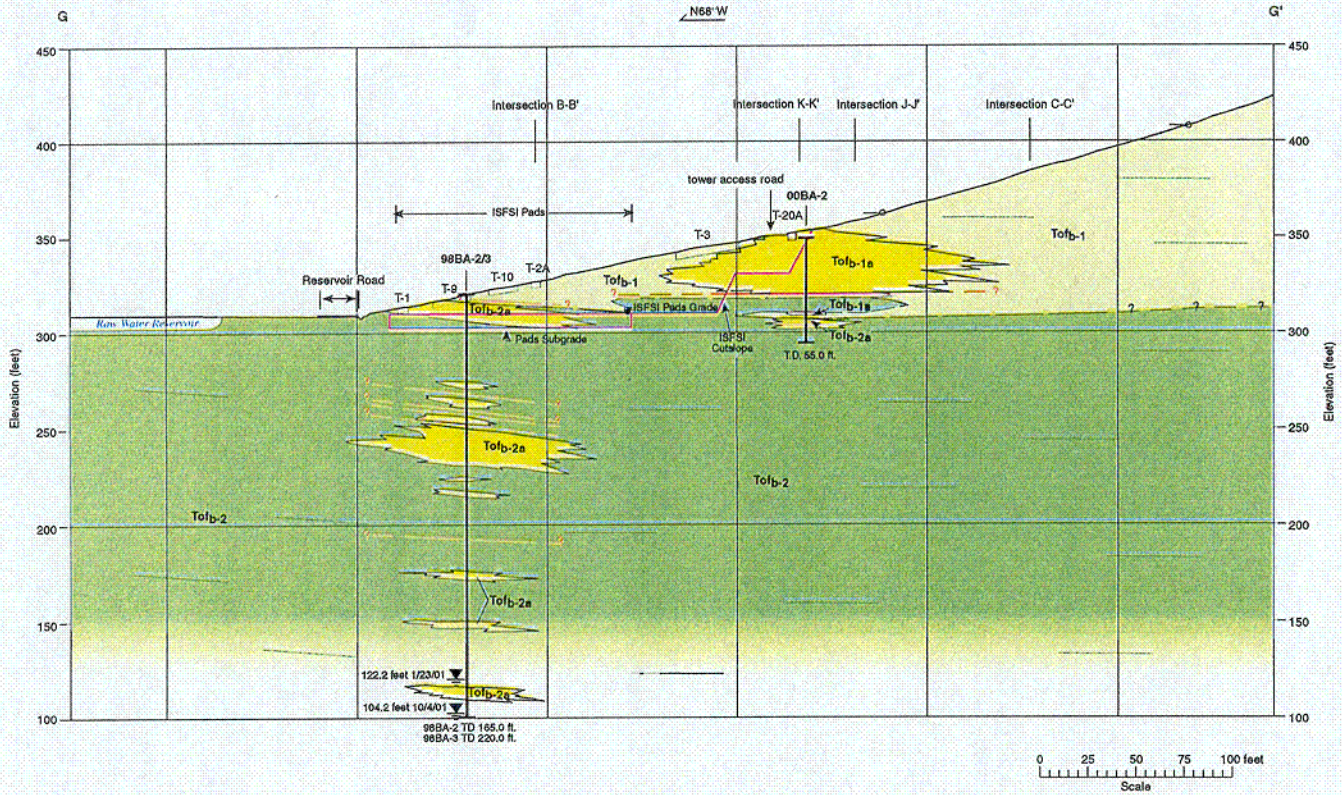
0 25 50 75 100 Feet
Scale

DIABLO CANYON ISFSI

FIGURE 21-19b
CROSS SECTION F-F'

GEO.DCPP.01.21 REV 2

December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

C18

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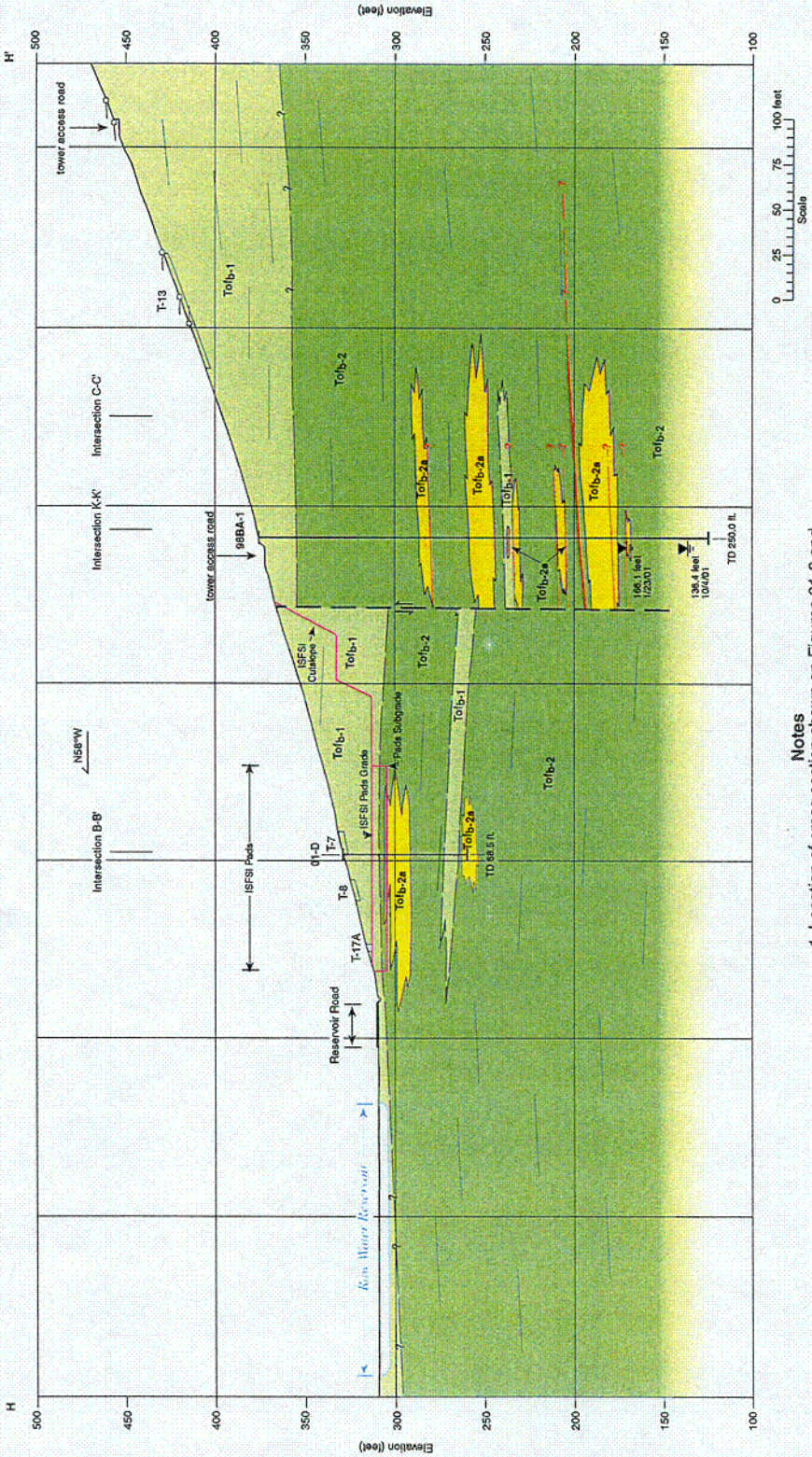
FIGURE 21-20
CROSS SECTION G-G'

GEO.DCPP.01.21 REV 2 December, 2001

C19



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

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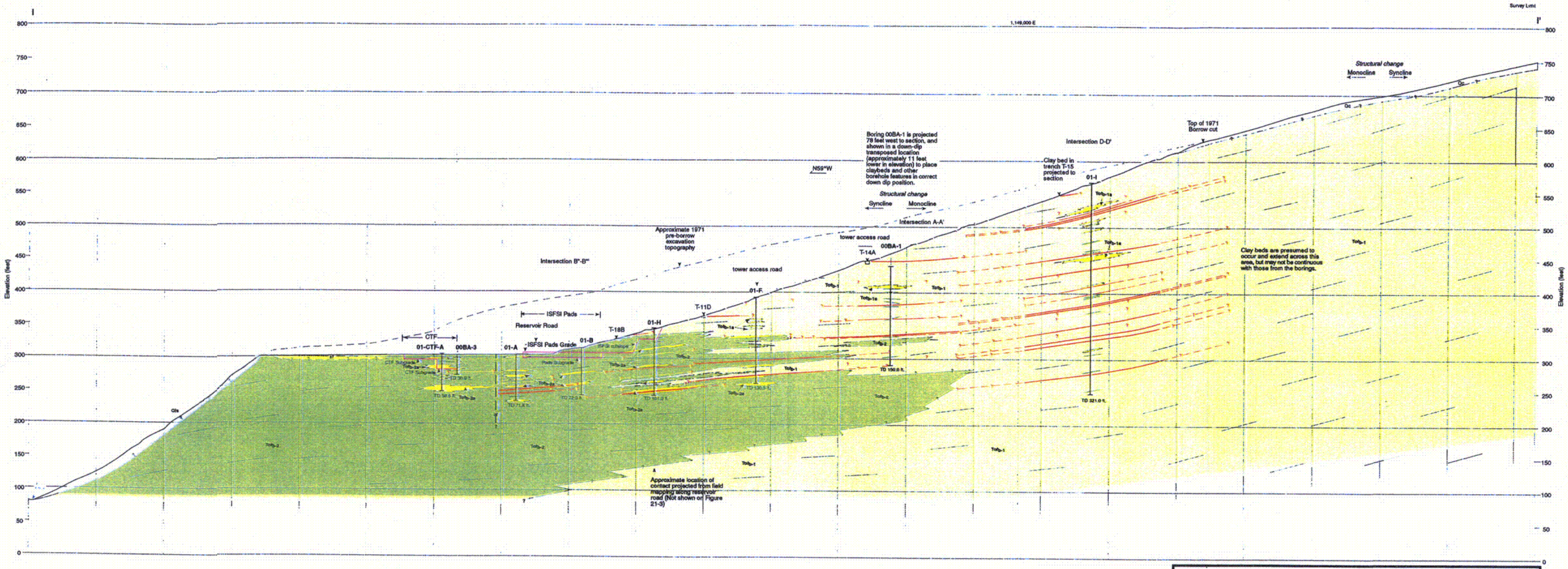
FIGURE 21-21
CROSS SECTION H-H'

December, 2001

GEO.DCPP01.21 REV 2



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

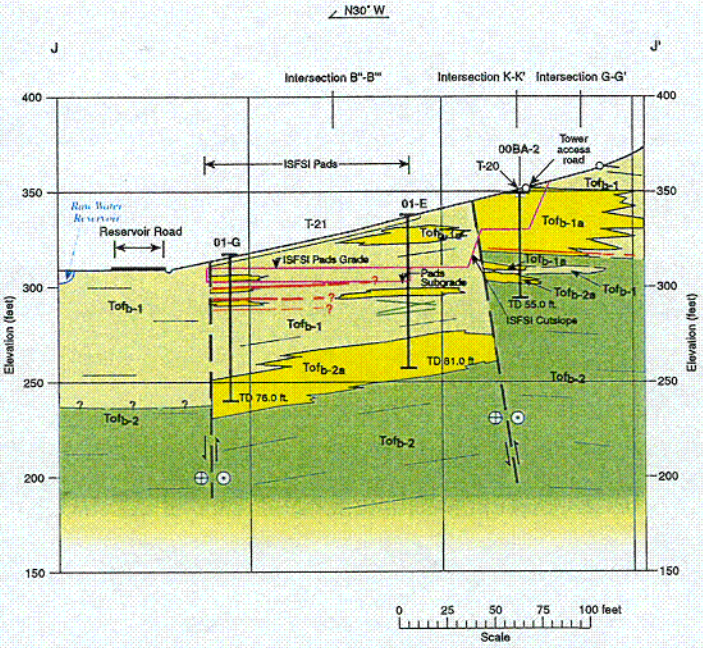
0 25 50 75 100 feet
Scale

DIABLO CANYON ISFSI

FIGURE 21-22
CROSS SECTION I-I'

GEO.DCPP.01.21 REV 2 December, 2001

C 20



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

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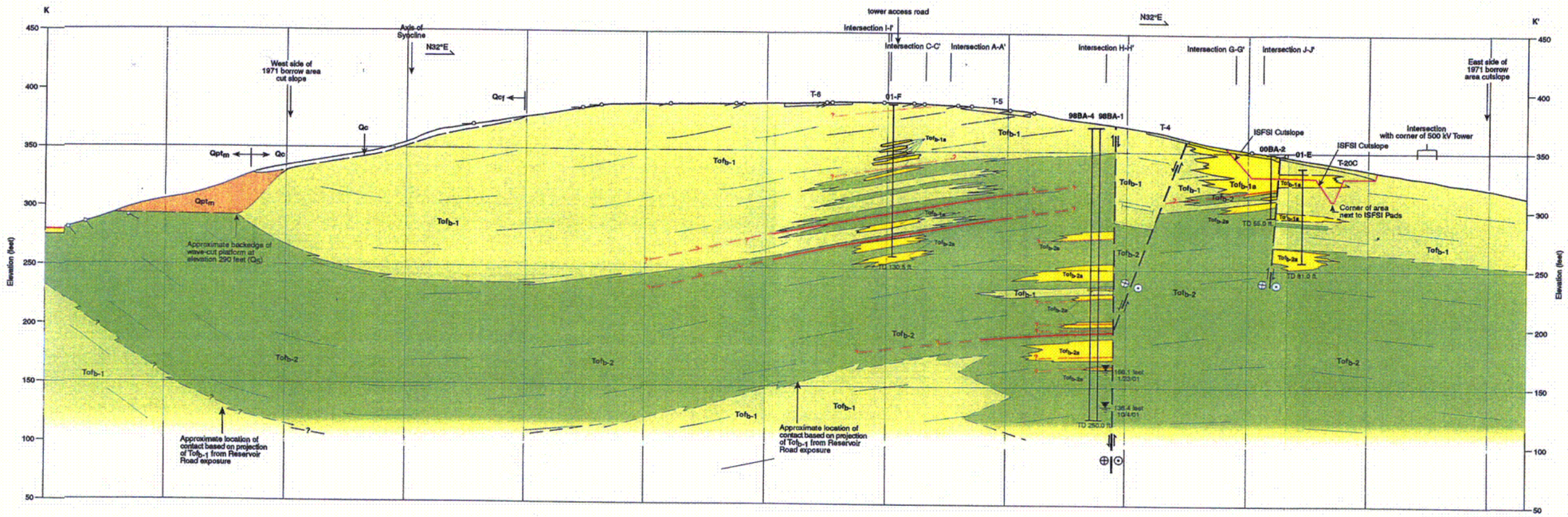
FIGURE 21-23
CROSS SECTION J-J'

GEO.DCPP.01.21 REV 2 December, 2001

C21



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale

0 25 50 75 100 feet
Scale

C22

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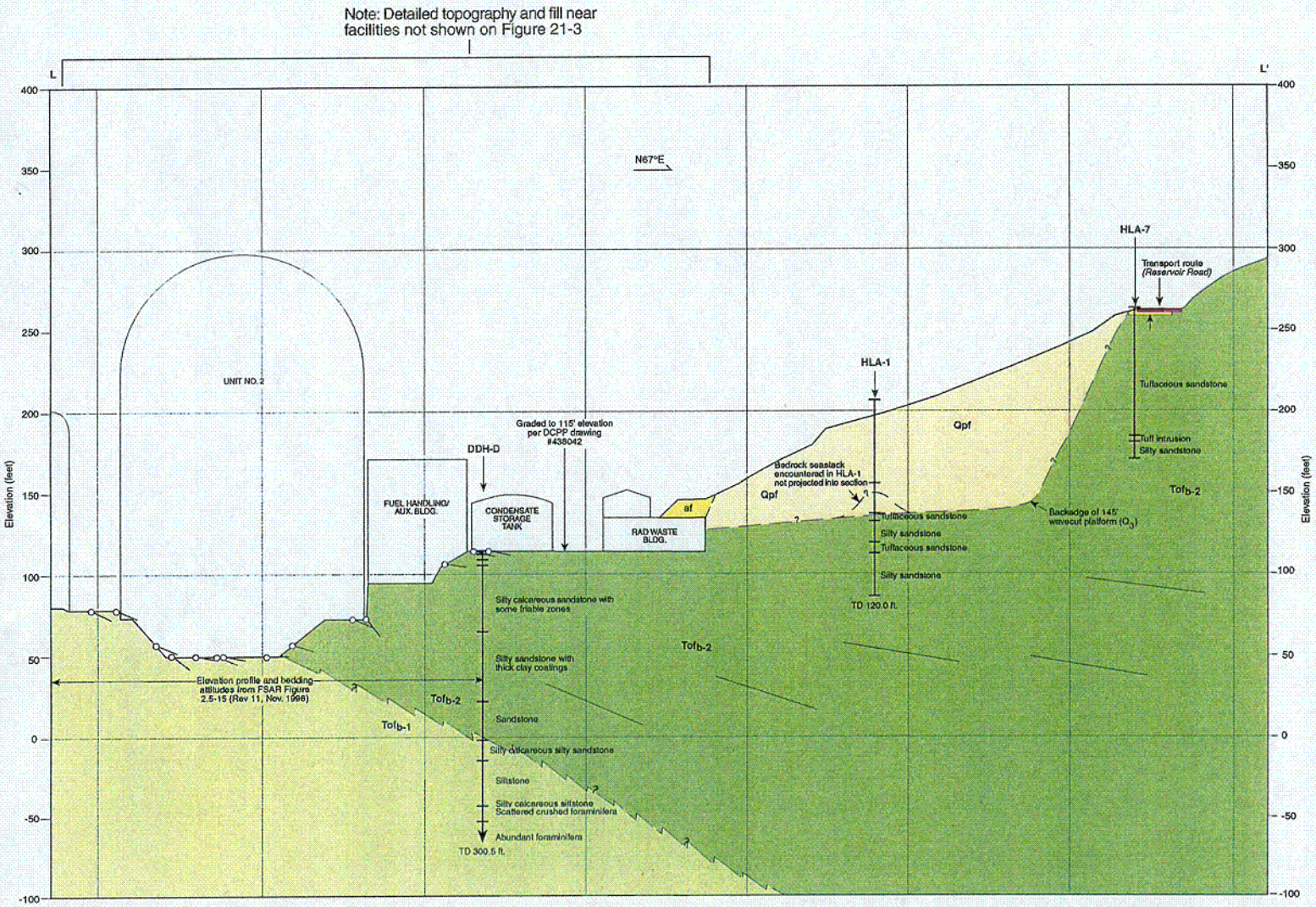
FIGURE 21-24
CROSS SECTION K-K'

GEO.DCPP.01.21 REV 2 December, 2001



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

0 25 50 75 100 feet
Scale

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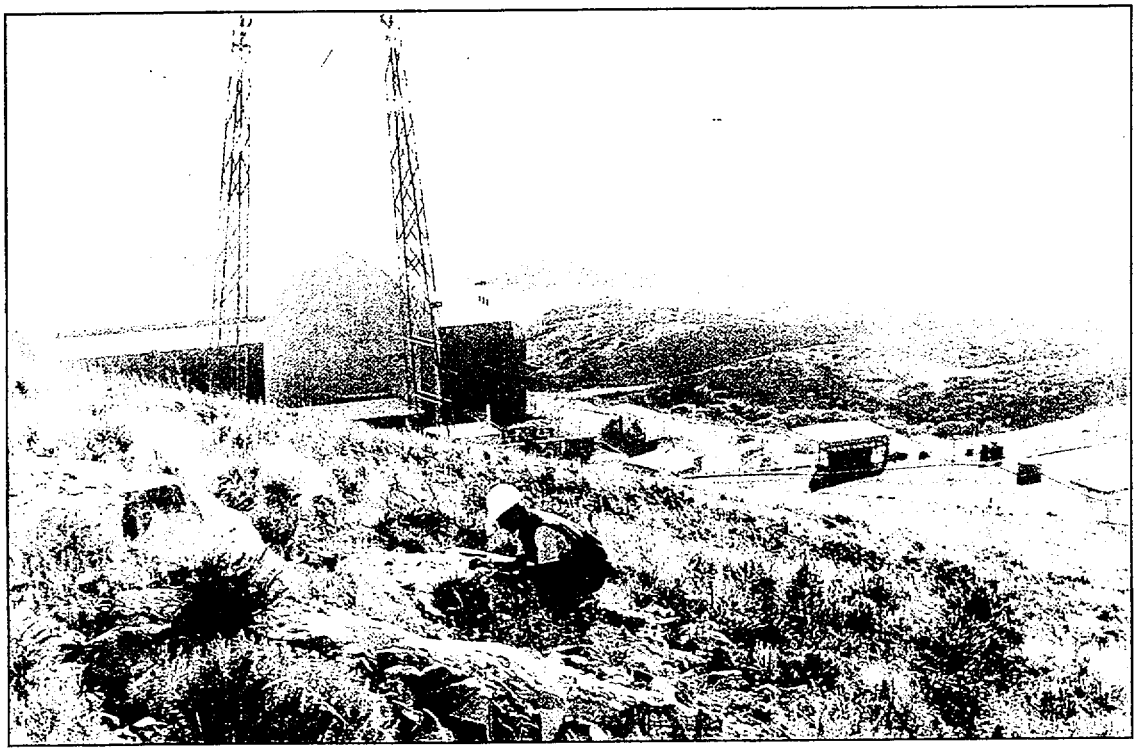
FIGURE 21-25
CROSS SECTION L-L'

GEO.DCPP.01.21 REV 2 December, 2001

C23



Geologist using Brunton compass to obtain a strike and dip measurement from a dolomite outcrop on the hillslope above, and south of, the ISFSI Pads. Photo roll JLB-2.

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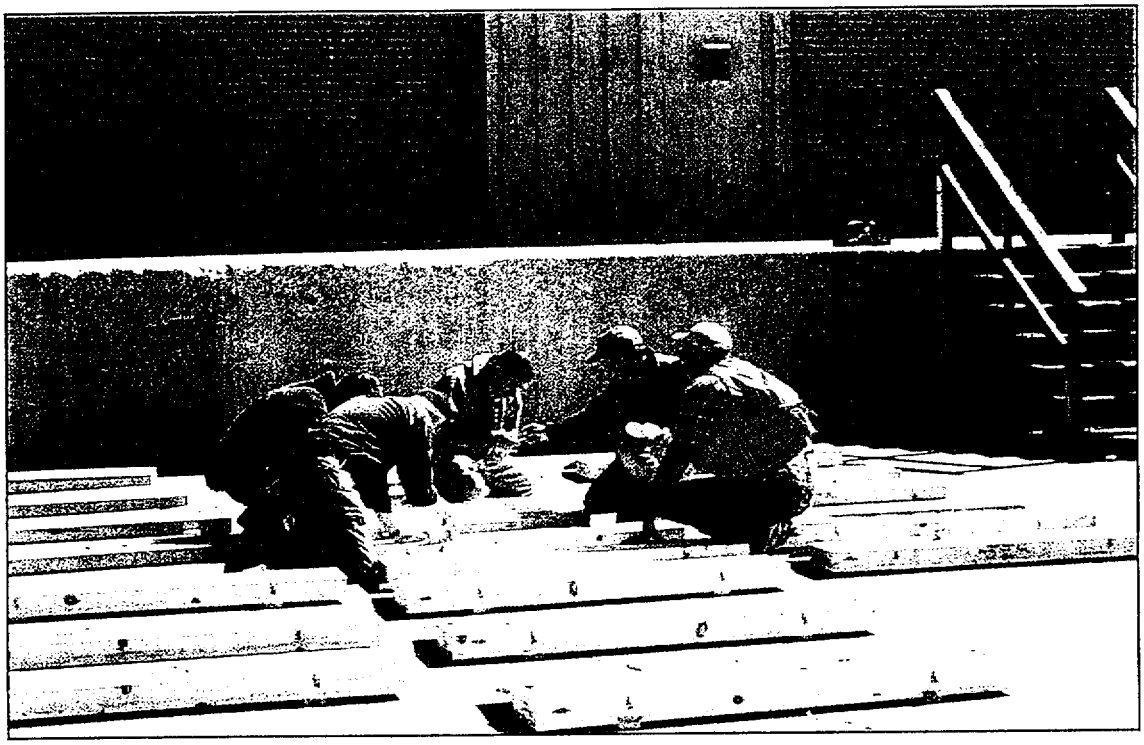
FIGURE 21-26
MEASURING BEDDING ATTITUDE,
ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2 December, 2001



Geological team examining and classifying rock core obtained from borings at the ISFSI study area. Photo Roll JGH R5.

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FIGURE 21-27
EXAMINING CORE FROM ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2 December, 2001

Exploratory boring core from ISFSI study area laid out in stratigraphic succession for studying geologic correlation of bedrock units. Photo roll JGH R5.

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FIGURE 21-28
CORE BOXES FROM ISFSI STUDY AREA LAID OUT IN STRATIGRAPHIC ORDER

GEO.DCPP.01.21 REV 2 December, 2001

Clay bed within dolomite (Tof_{b-1}) with sample tube in trench T-14B. Photo roll JLB-8.

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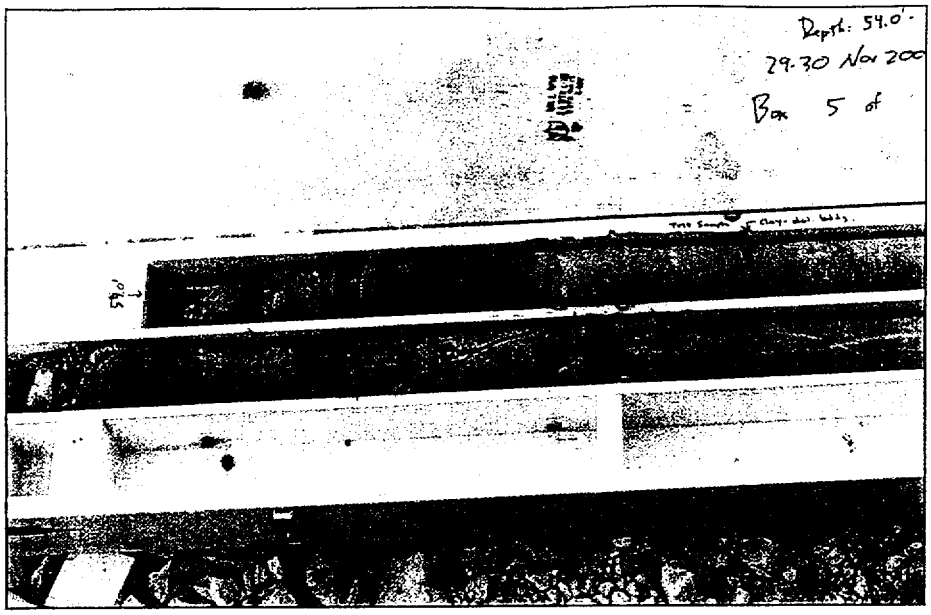
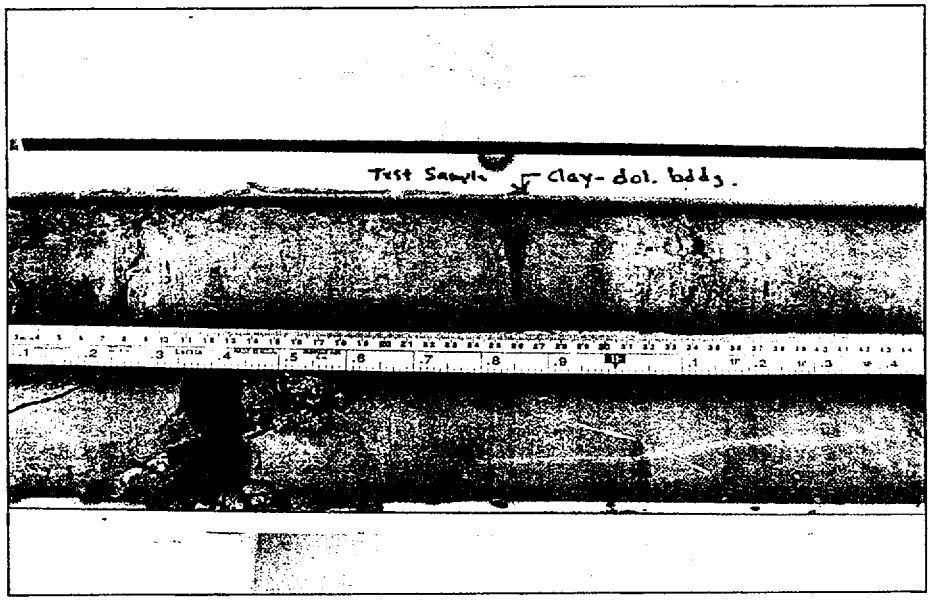
FIGURE 21-29 CLAY BED IN TRENCH T-14B

GEO.DCPP.01.21 REV 2 December, 2001





Clay bed in boring 00BA-1 at 55 feet. Note tight contacts with bounding rock, and low dip angle. Photo roll JLB-8

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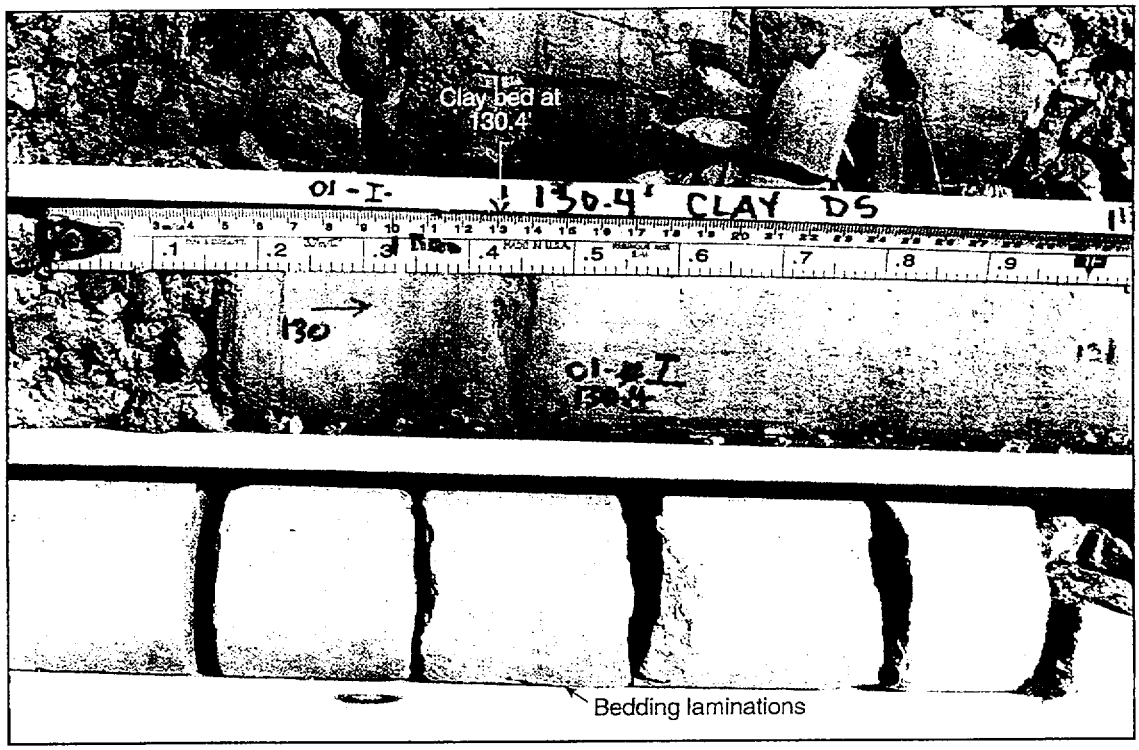
FIGURE 21-30 CLAY BED AT 55 FEET IN BORING 00BA-1

GEO.DCPP.01.21 REV 2 December, 2001



Typical appearance of clay bed and bedding laminations in a section of core at 130 feet from boring 01-I, south of the ISFSI. Clay bed occurs within Tof_{b-1}.
Photo roll 01JLB-ba.

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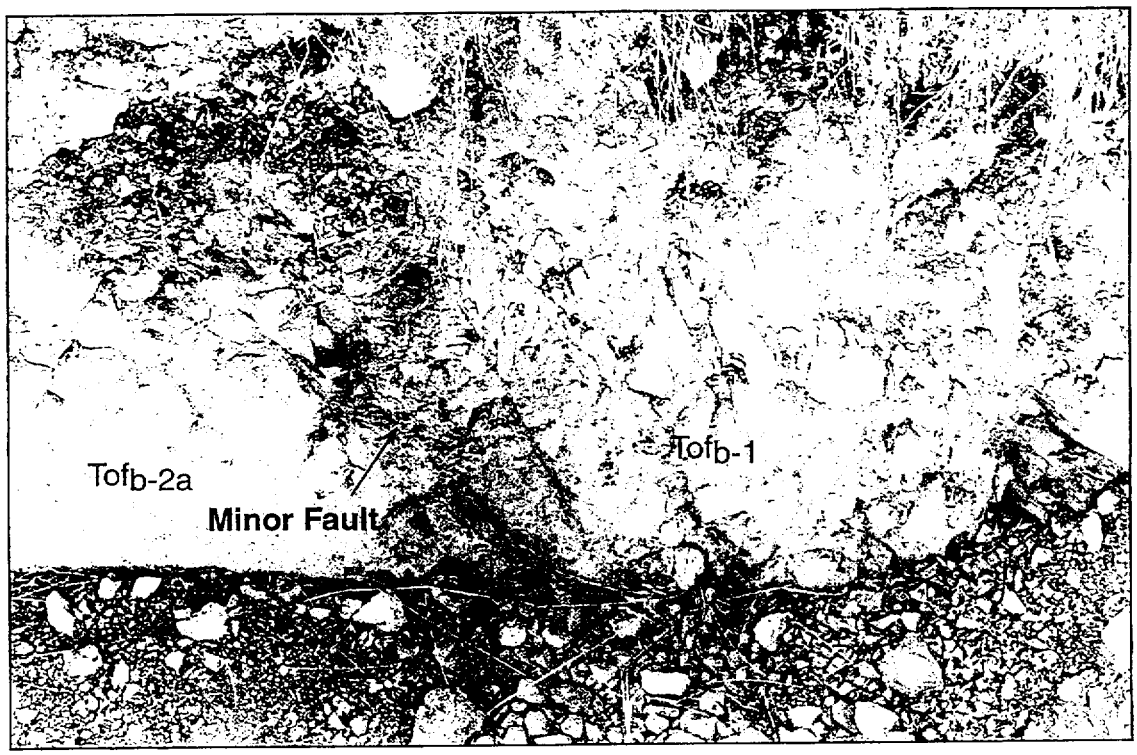
FIGURE 21-31
CLAY BED AT 130 FEET IN BORING 01-I

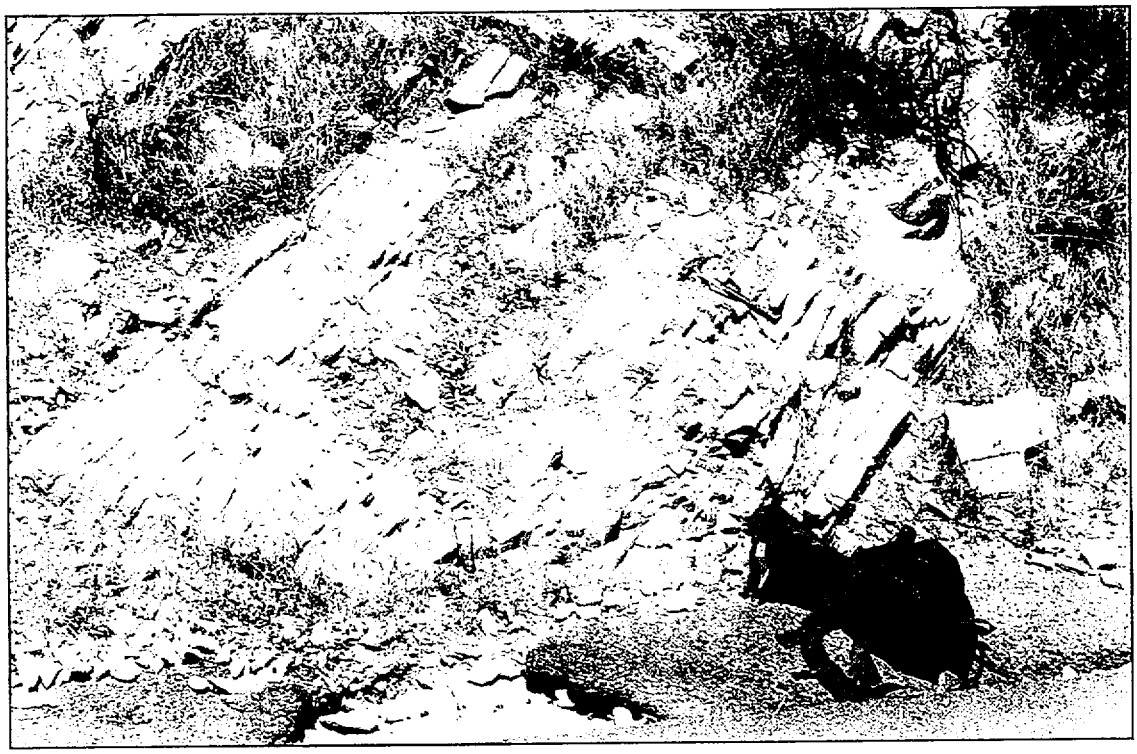
GEO.DCPP.01.21 REV 2 December, 2001



Minor fault in trench T-1 juxtaposing friable sandstone (Tof_{b-2a}) on left against dolomite (Tof_{b-1}) on the right. Photo roll JLB-2.

DIABLO CANYON ISFSI
FIGURE 21-32 MINOR FAULT IN TRENCH T-1

GEO.DCPP.01.21 REV 2 December, 2001



Thin-to medium-bedded dolomite (Tof_{b-1}) exposed in the roadcut of Reservoir Road directly southwest of the ISFSI. Note the laminations and bedding parting surfaces in the dolomite. Gray zones in the rock are believed to be petroliferous stains.
Photo roll JLB4-3.

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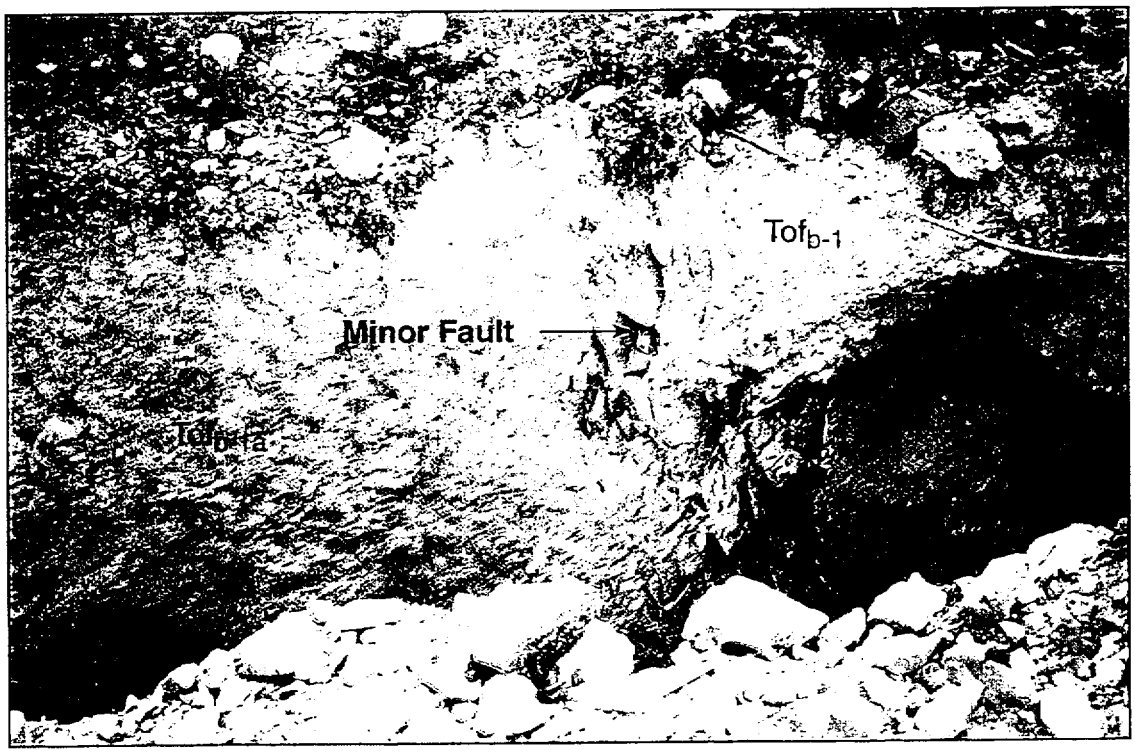
FIGURE 21-33
BEDDED DOLOMITE ON RESERVOIR ROAD

GEO.DCPP.01.21 REV 2 December, 2001



Friable dolomite (Tof$_{b-1a}$; left part of photo) in contact with closely-fractured dolomite (Tof$_{b-1}$; right part of photo) in trench T-20A. Shear fabric in dolomite at the contact indicates the presence of a minor fault. Photo roll JGH 2-1.

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FIGURE 21-34 MINOR FAULT IN TRENCH T-20A

GEO.DCPP.01.21 REV 2 December, 2001

Outcrop of thick to massive bedded, weathered sandstone (Tof_{b-2}), directly west of the ISFSI. Photo roll JLB OLD-2.

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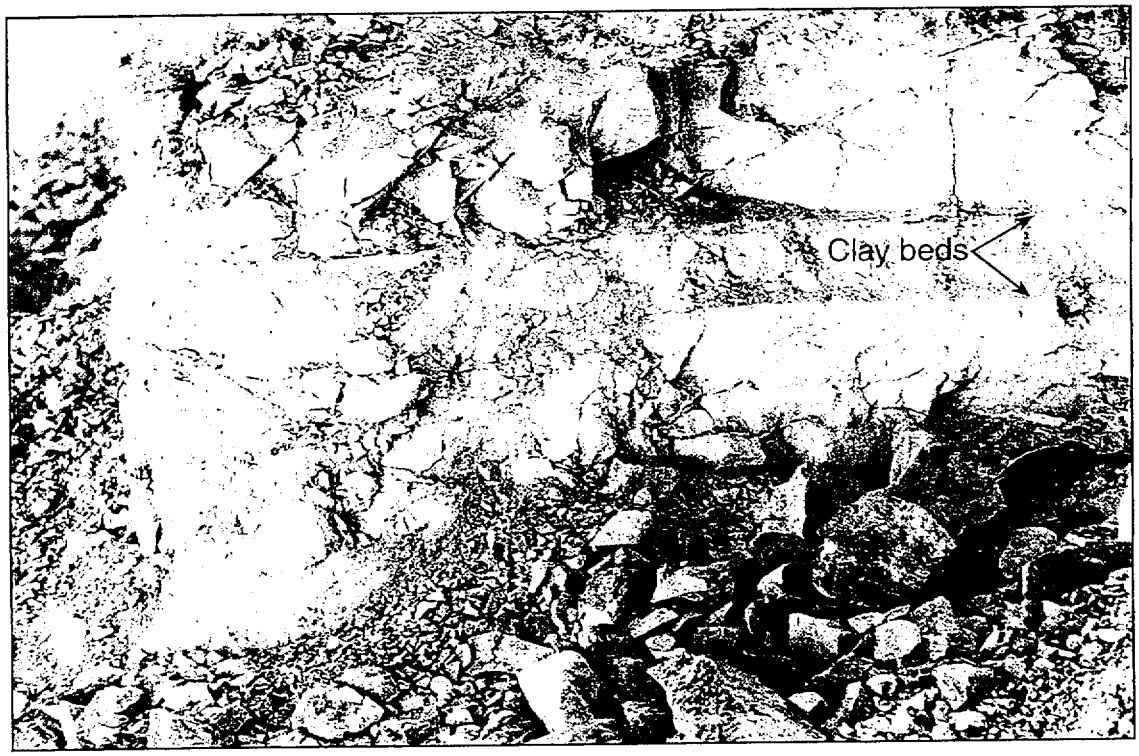
FIGURE 21-35
SANDSTONE OUTCROP IN THE ISFSI STUDY AREA

GEO.DCPP.01.21 REV 2 December, 2001



Typical dolomite (Tof_{b-1}) and thin clay beds exposed in trench T-11C. Clay beds are subhorizontal and define bedding. Photo roll 01JLB-1.

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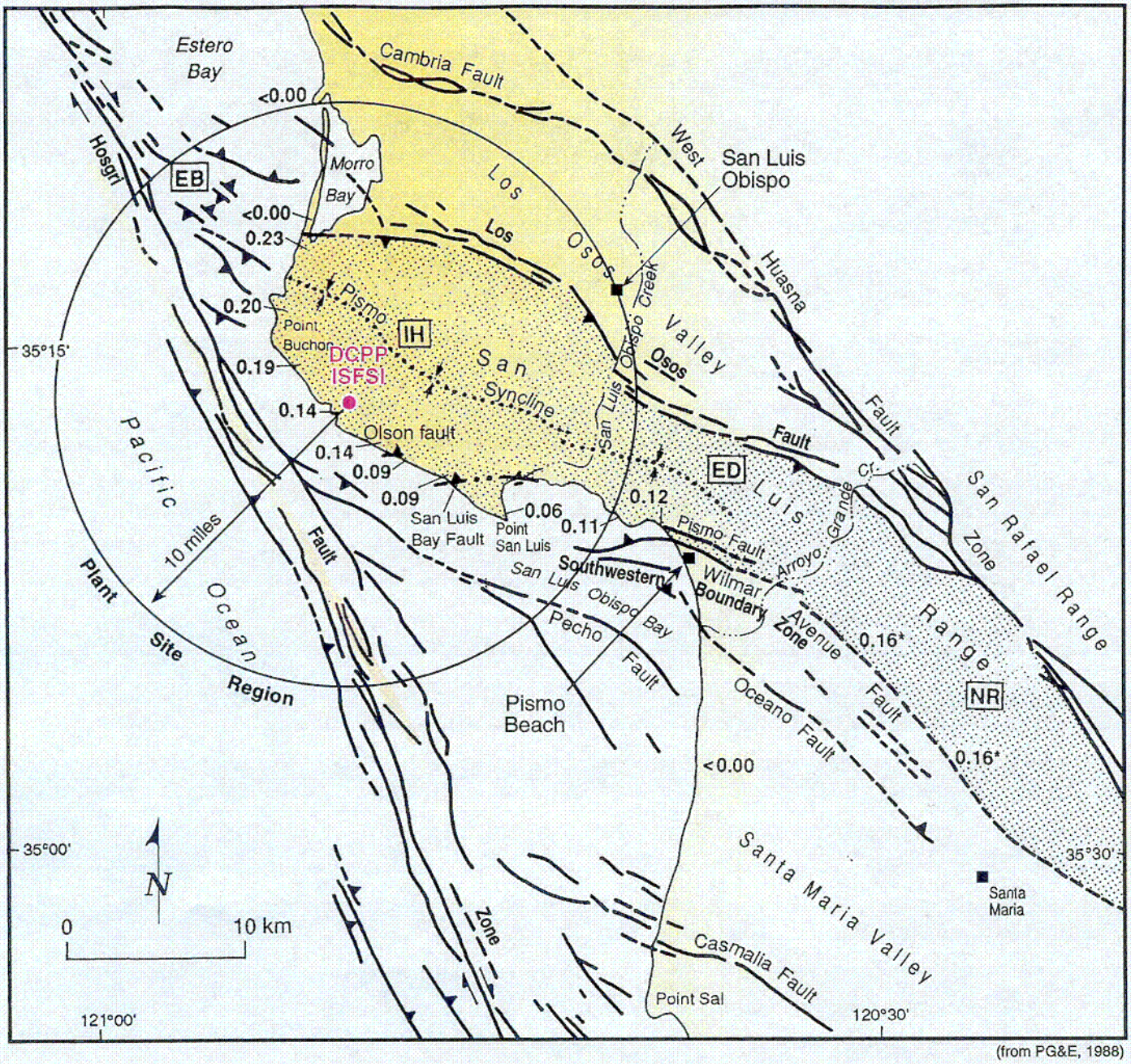
FIGURE 21-36
CLAY BEDS AND DOLOMITE IN TRENCH T-11C

GEO.DCPP.01.21 REV 2 December, 2001



(from PG&E, 1988)

Explanation

Fault: dashed where approximately located; teeth indicate dip direction of reverse fault; arrows indicate relative sense of displacement

Syncline axial trace

0.14 Late Pleistocene (post 120,000 years ago) uplift rate (meters/1000 yr)

0.16* Uplift rate (meters/1000 yr) based on the altitude and estimated age (560,000 years) of the Q_7 marine terrace (modified from PG&E, Final Report of the Long Term Seismic Program, 1988).

EB Estero Bay Subblock

IH Irish Hills Subblock

ED Edna Subblock

NR Newsom Ridge Subblock

Average fault trend (338°) used for ground motion analyses

C24

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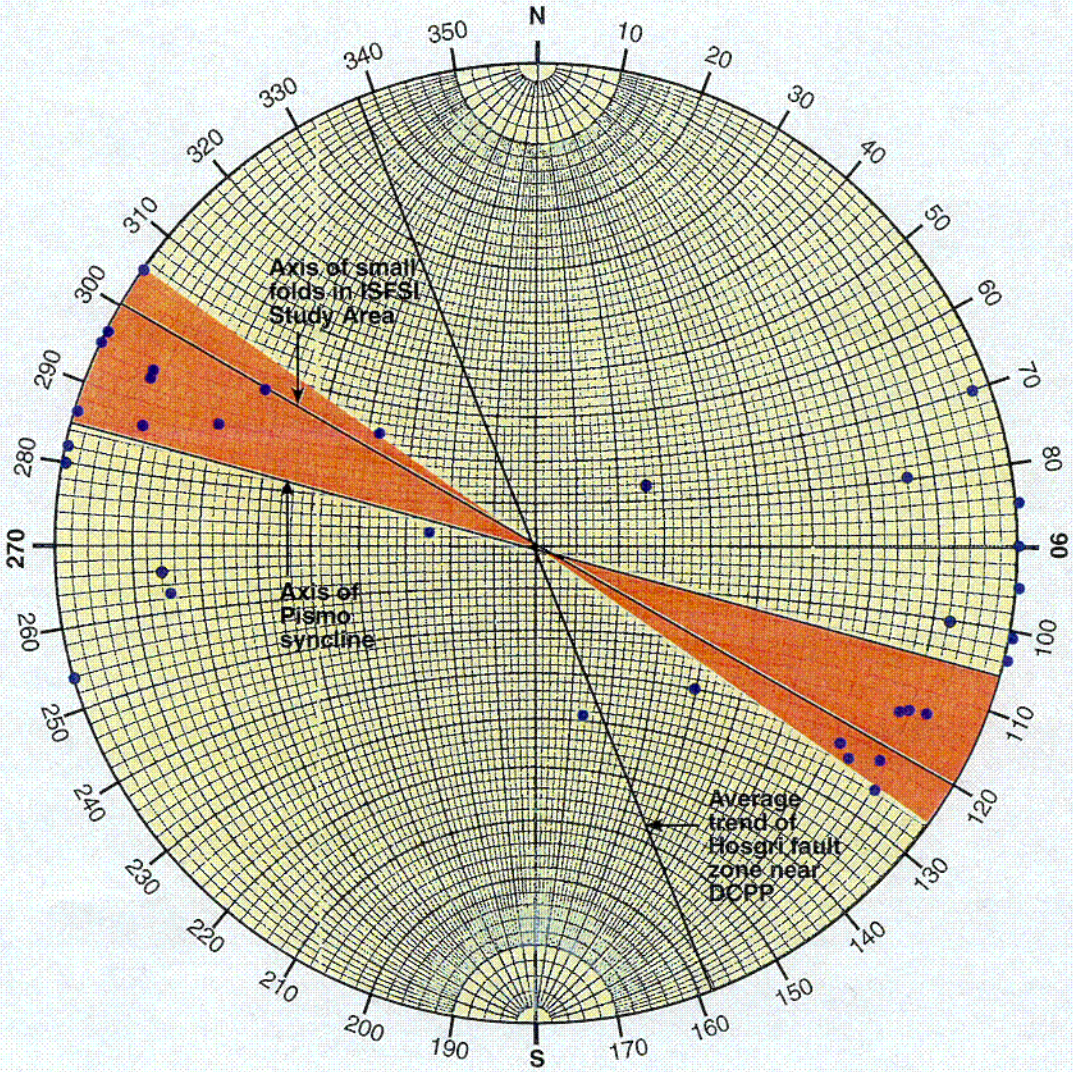
FIGURE 21-37
REGIONAL STRUCTURE MAP

GEO.DCPP.01.21 REV 2 December, 2001



Explanation

- General range in strike of zone of minor faults
- Rake of slickenside on fault plane of minor faults

Equal-angle lower hemisphere plot.

C25

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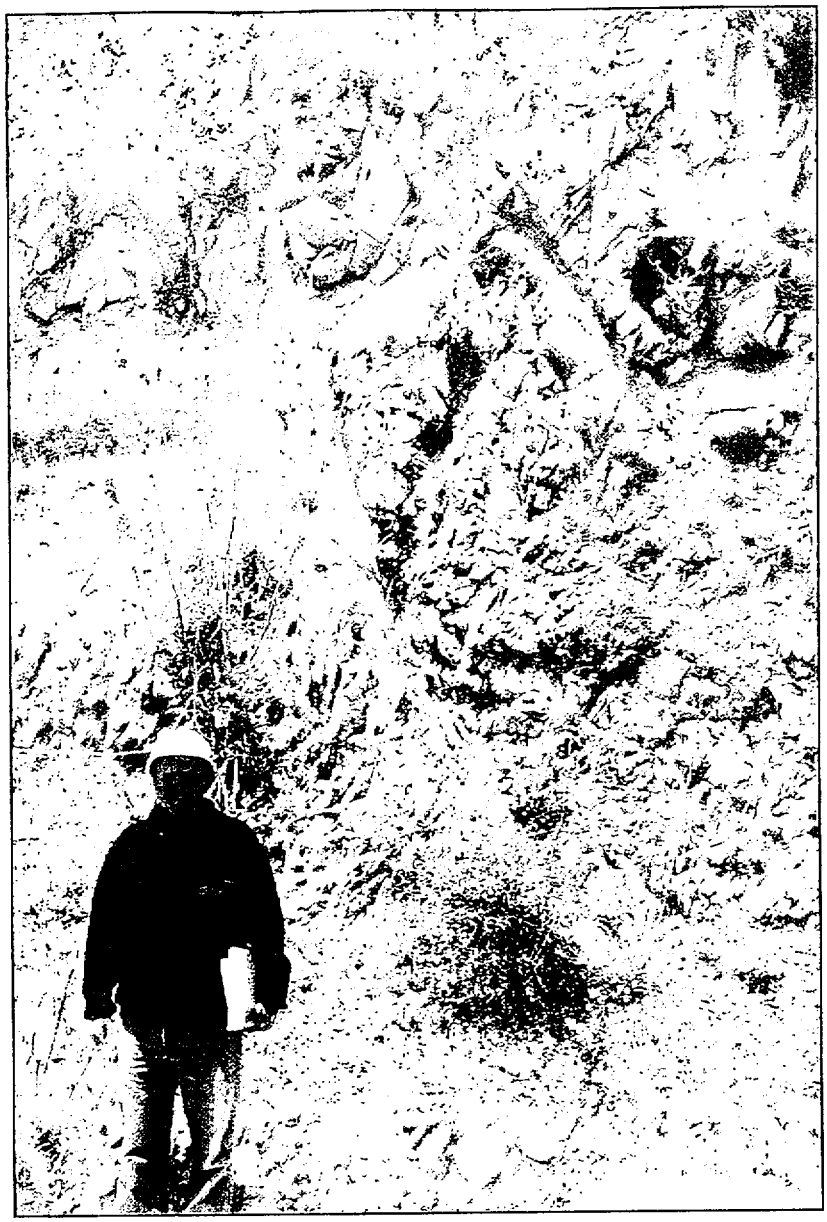
FIGURE 21-38
COMPARISON OF ORIENTATIONS OF MINOR FAULTS AND FOLDS IN THE ISFSI STUDY AREA WITH OTHER STRUCTURES

GEO.DCPP.01.21 REV 2 December, 2001

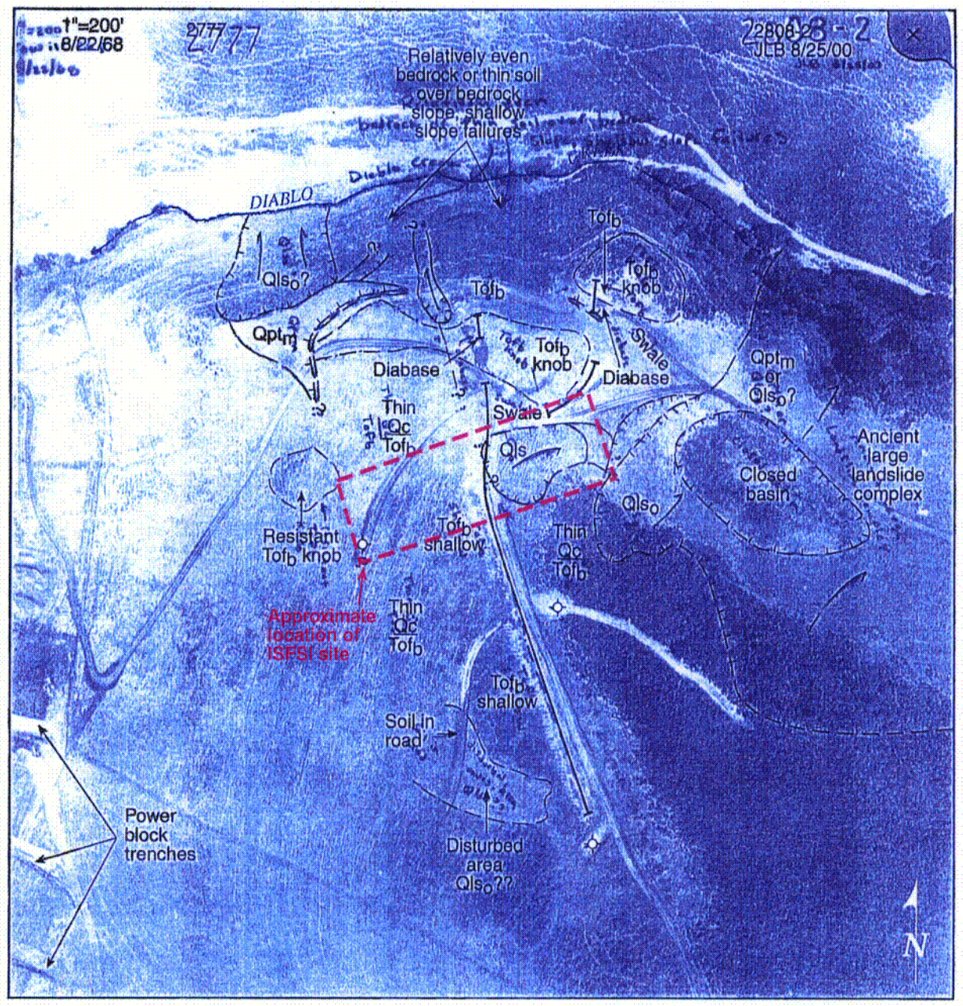


Northward view of Diablo Creek Road cut showing steeply dipping minor faults in dolomite of unit Tof_{b-1}. Slickensides and mullions on the fault plane indicate primarily strike-slip displacement, but bedding also suggests a component of down-to-the- east vertical separation of approximately 3 to 6 feet. These faults are located along projection of faults exposed in trenches at the ISFSI, approximately 800 feet to the southeast, that have similar strike and slickenside/mullion rakes. Photo roll JLB5/16-1.

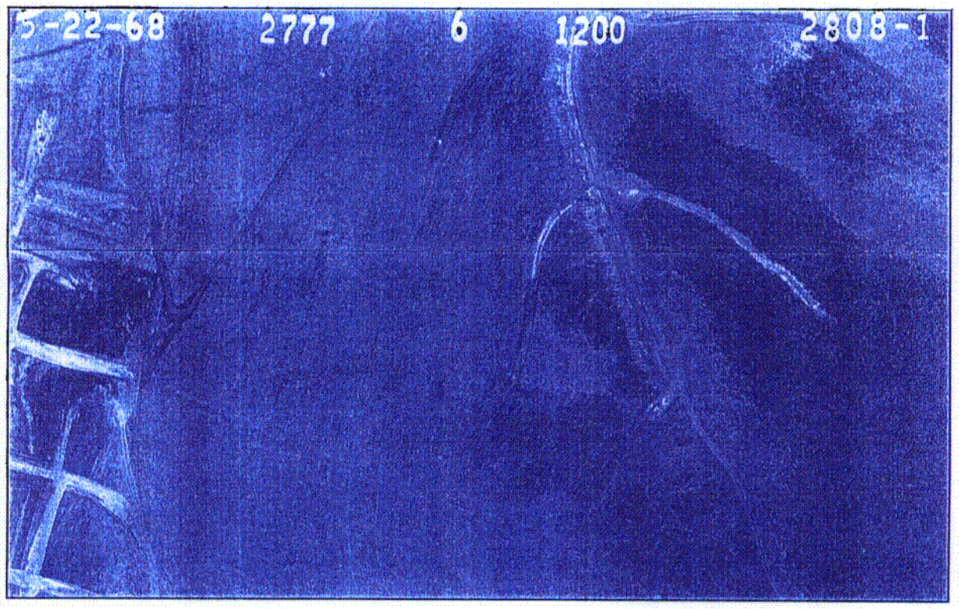
DIABLO CANYON ISFSI

FIGURE 21-39
MINOR FAULTS ALONG DIABLO CREEK ROAD

GEO.DCPP.01.21 REV 2 December, 2001



1968 stereo air photos (2777; 2808-1 and 2808-2) of ISFSI study area prior to the 1971 excavation of the borrow site. Diablo Creek traverses the upper (northern) part of the photo. Trenches for the power block are evident in the lower left. The road that follows the ridge crest in center of photo was removed during 1971 excavation of the borrow area. No features indicating deep seated landslides are present at the site; large landslides are evident to the east, however. The small landslide south of the word "swale" is shallow and was removed in the 1971 excavations. See Figure 21-3 for unit descriptions. To view with a stereoscope, fold and adjust the photos as necessary.



C26

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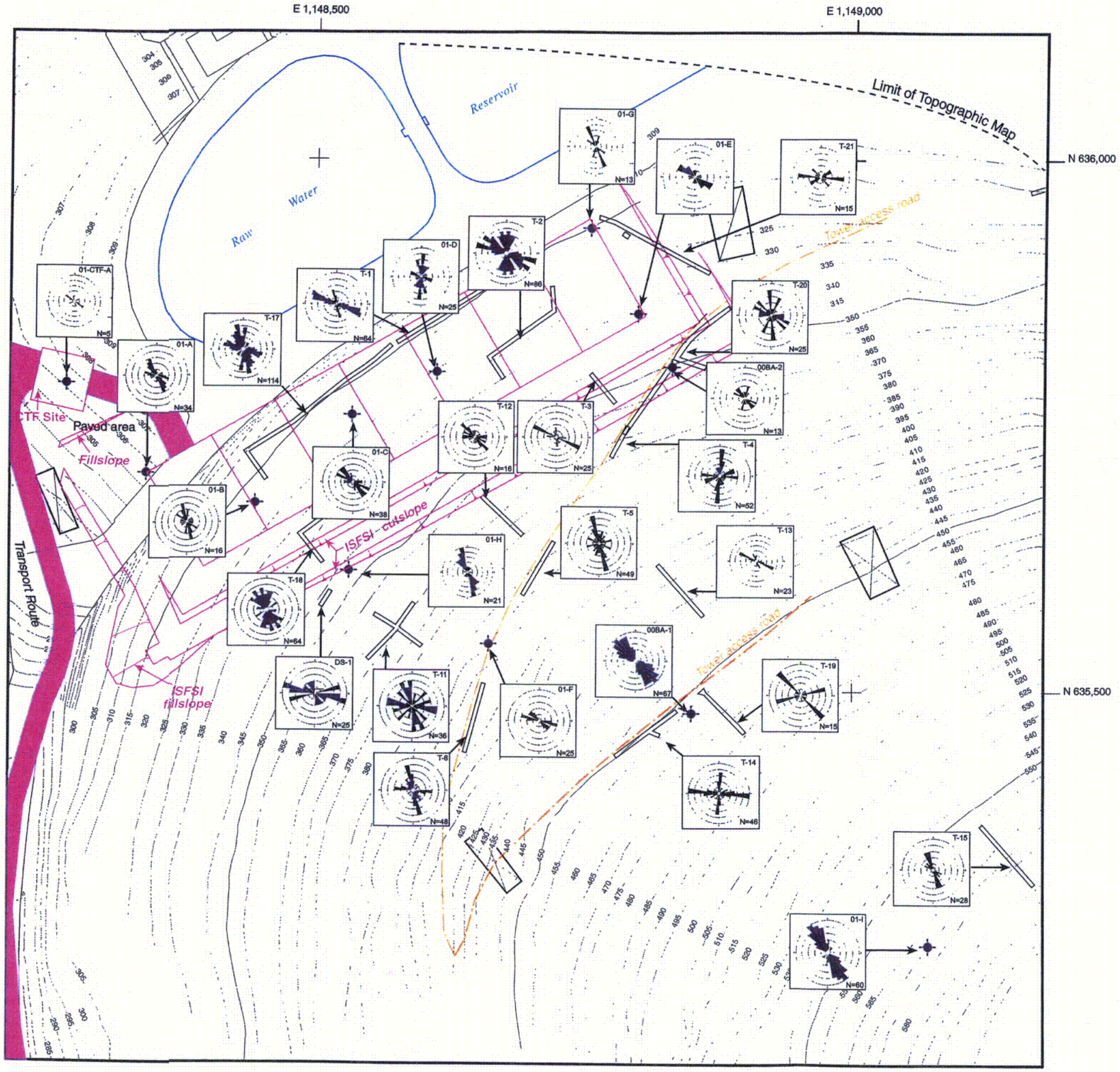
FIGURE 21-40
1968 AERIAL PHOTOGRAPH OF ISFSI STUDY AREA



Explanation

Rose Plot — Trench or boring number; Azimuth plot of fractures (joints, faults) in trenches and fractures in borings; Number of Joints and/or faults

Exploratory trench

Boring for ISFSI; sampled with optical televiewer

Footprint of 500-kV tower

Note: Data from Table 21-7

N

0 50 100 150 200

Contour interval = 5 feet

Note: ISFSI geometry is based on PG&E Enercon Drwg. Base map from No. PGE-009-sk-001 dated 9/27/01

C27

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FIGURE 21-41
AZIMUTH PLOTS OF FAULTS AND JOINTS IN BORINGS AND TRENCHES

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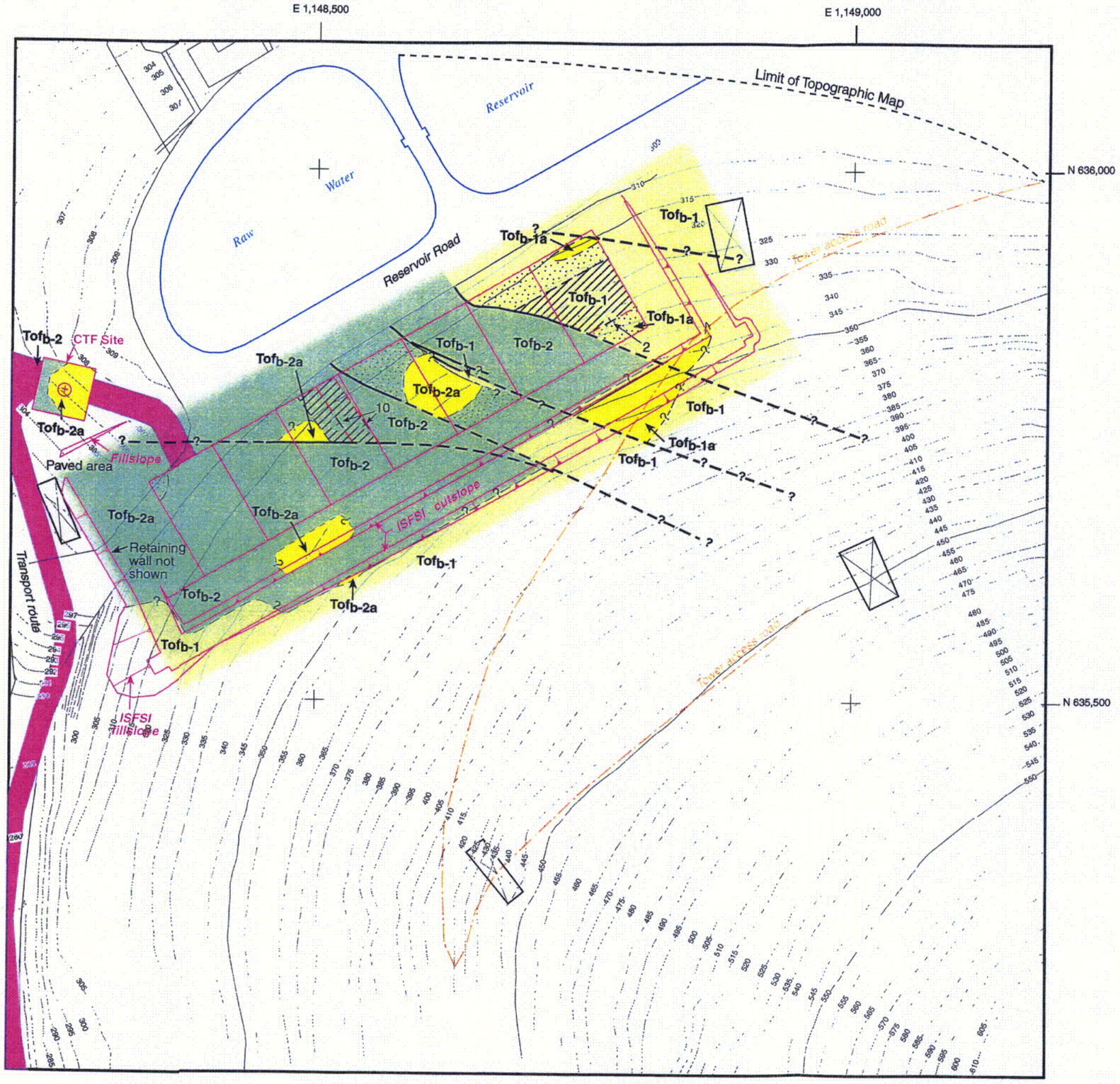

Explanation

Footprint of 500-kV tower

Outline of ISFSI pads (subgrade at el. 302') and CTF (subgrade at about el. 286' and 296'.)

Proposed cutslope above and fillslope to the west of ISFSI pads

DOLOMITE UNIT

Tofb-1 Dolomite, clayey dolomite, dolomitic siltstone to fine-grained dolomitic sandstone, and limestone. The unit contains occasional discontinuous to continuous (tens to hundreds of feet) clay beds that are generally 1/32- to 1/2-inch thick, but locally are thicker. Rocks in this unit are moderately to well cemented, moderately hard to hard, moderately to slightly weathered, brittle and typically medium strong.

Tofb-1a Friable dolomite and dolomitic siltstone of unit Tofb-1. These rocks typically have low hardness, are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

SANDSTONE UNIT

Tofb-2 Fine to coarse-grained dolomitic sandstone and sandstone (arkosic to arenitic) with lesser dolomite beds. Detrital clasts are composed primarily of dolomitized feldspars, marine fossil fragments, and volcanic rock fragments. Discontinuous clay beds that are generally less than 1/2-inch thick occur locally within the unit. The rocks are of low to medium hardness, moderately to well cemented and typically medium strong.

Tofb-2a Friable sandstone of unit Tofb-2. These rocks typically are of low hardness are very weak to weak, and occur as discontinuous zones where weathering and/or alteration has been concentrated. Inferred lateral extent of friable zones is schematic.

Friable bedrock expected within 5 feet below ISFSI pads subgrade

Clay bed, approximate dip indicated

Clay bed expected within 5 feet below ISFSI pads subgrade

Note: Projection of lithologic units, clay beds, and faults are based on surface mapping and borings, and are considered approximate

N

0 50 100 150 200

Contour interval = 5 feet

C28

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FIGURE 21-42
GEOLOGY OF ISFSI AND CTF SITES AT PROPOSED FINAL GRADES

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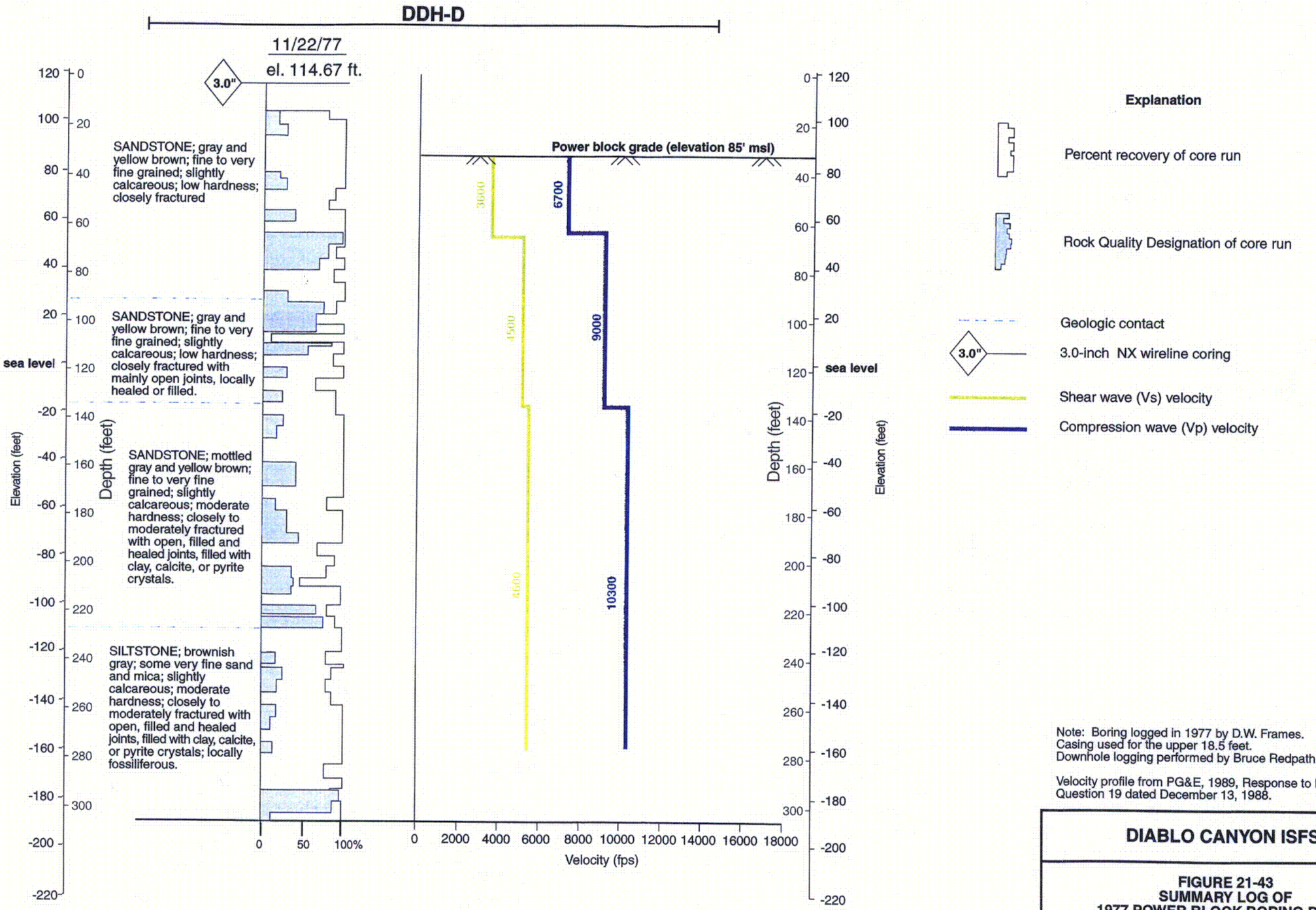

Note: Boring logged in 1977 by D.W. Frames.
Casing used for the upper 18.5 feet.
Downhole logging performed by Bruce Redpath.

C29

Velocity profile from PG&E, 1989, Response to NRC Question 19 dated December 13, 1988.

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FIGURE 21-43
SUMMARY LOG OF
1977 POWER BLOCK BORING DDH-D

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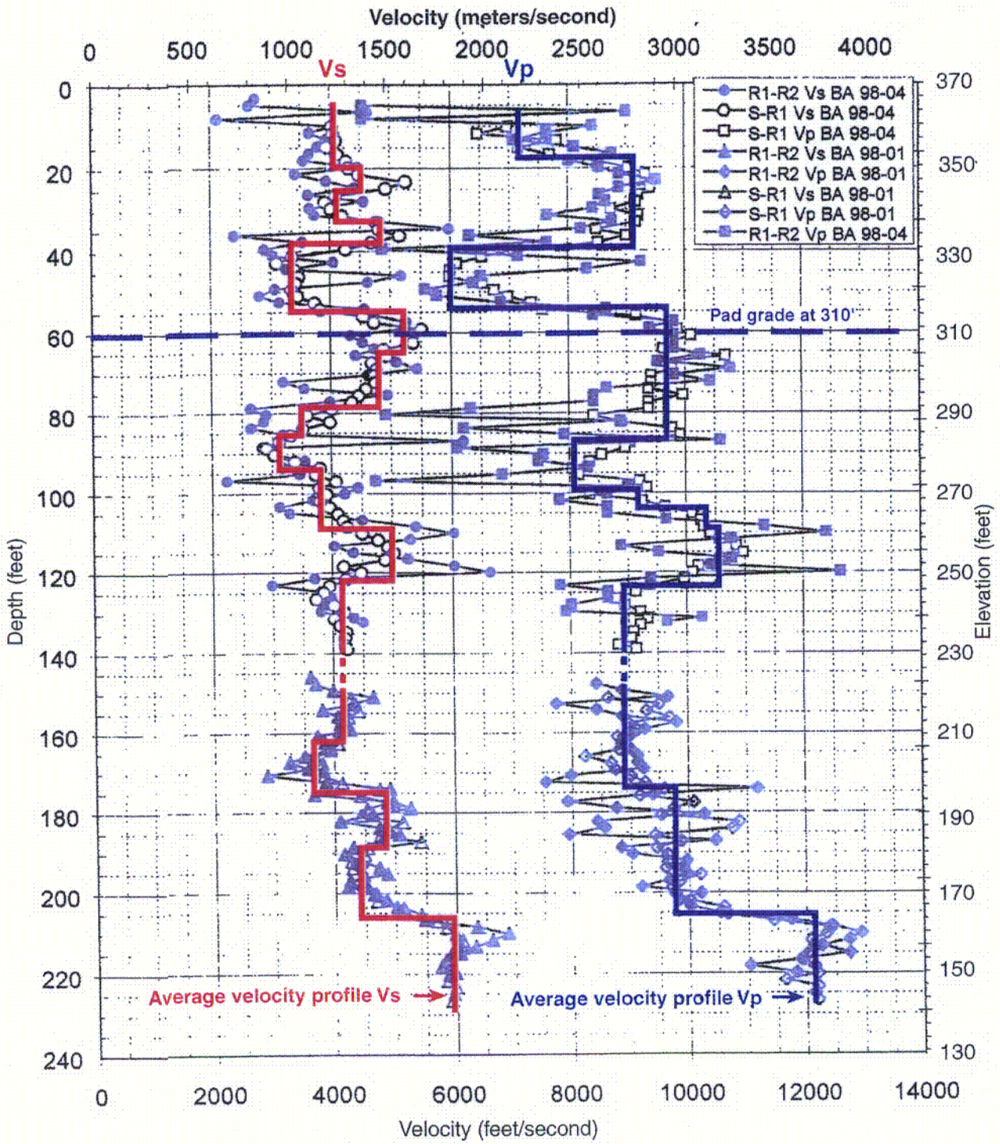
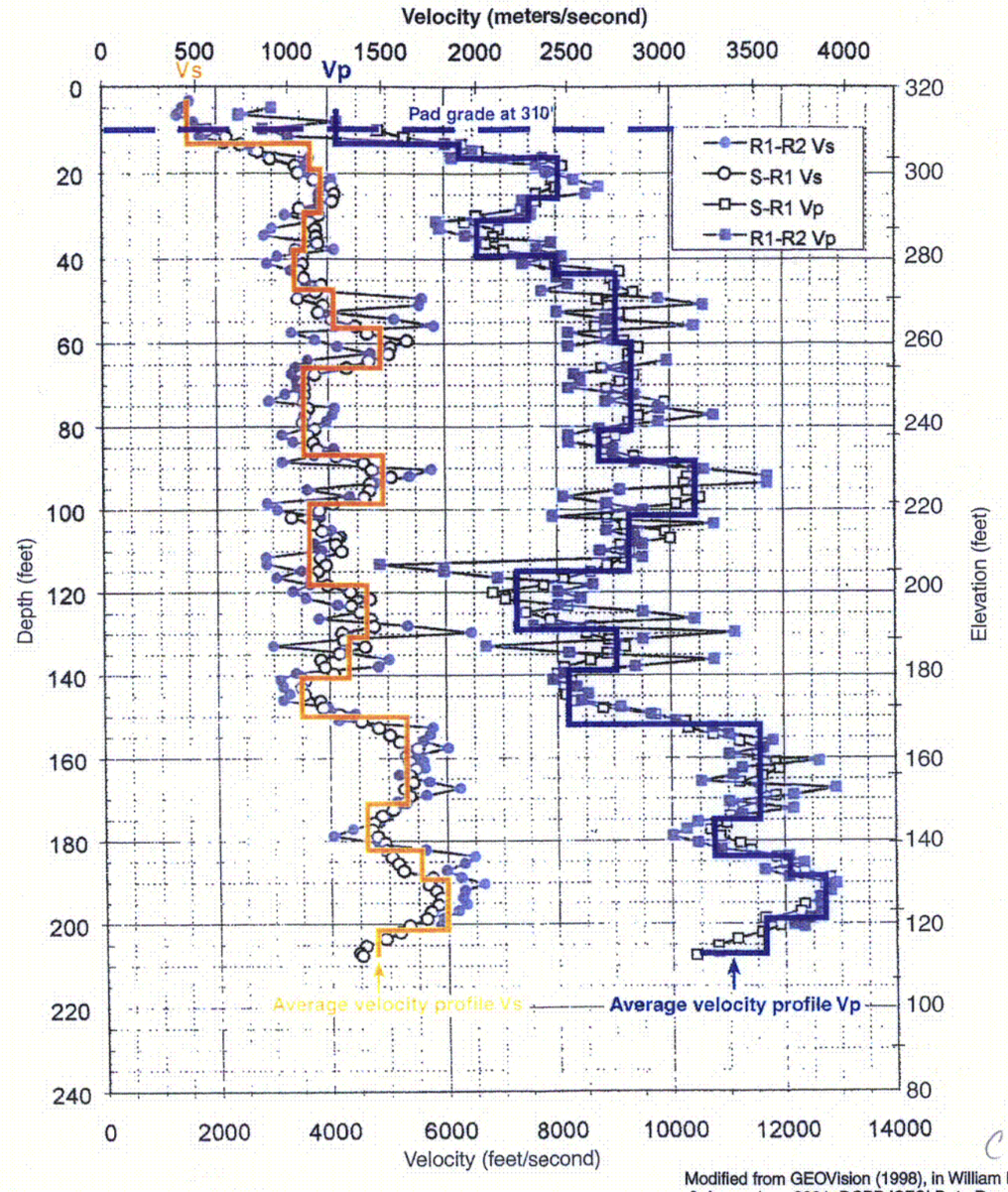
Borings 98BA-1 and 98BA-4



Note: Average velocity profiles interpreted from data

R1 - R2 = Receiver-to-receiver velocity (3.3-foot spacing)
S-R1 = Source-to-receiver velocity (10.3-foot spacing)

Boring 98BA-3



C30

Modified from GEOVision (1998), in William Lettis & Assoc. Inc., 2001, DCPP ISFSI Data Report C.

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FIGURE 21-44
ISFSI SITE SUSPENSION LOGS AND INTERPRETED AVERAGE SEISMIC VELOCITIES

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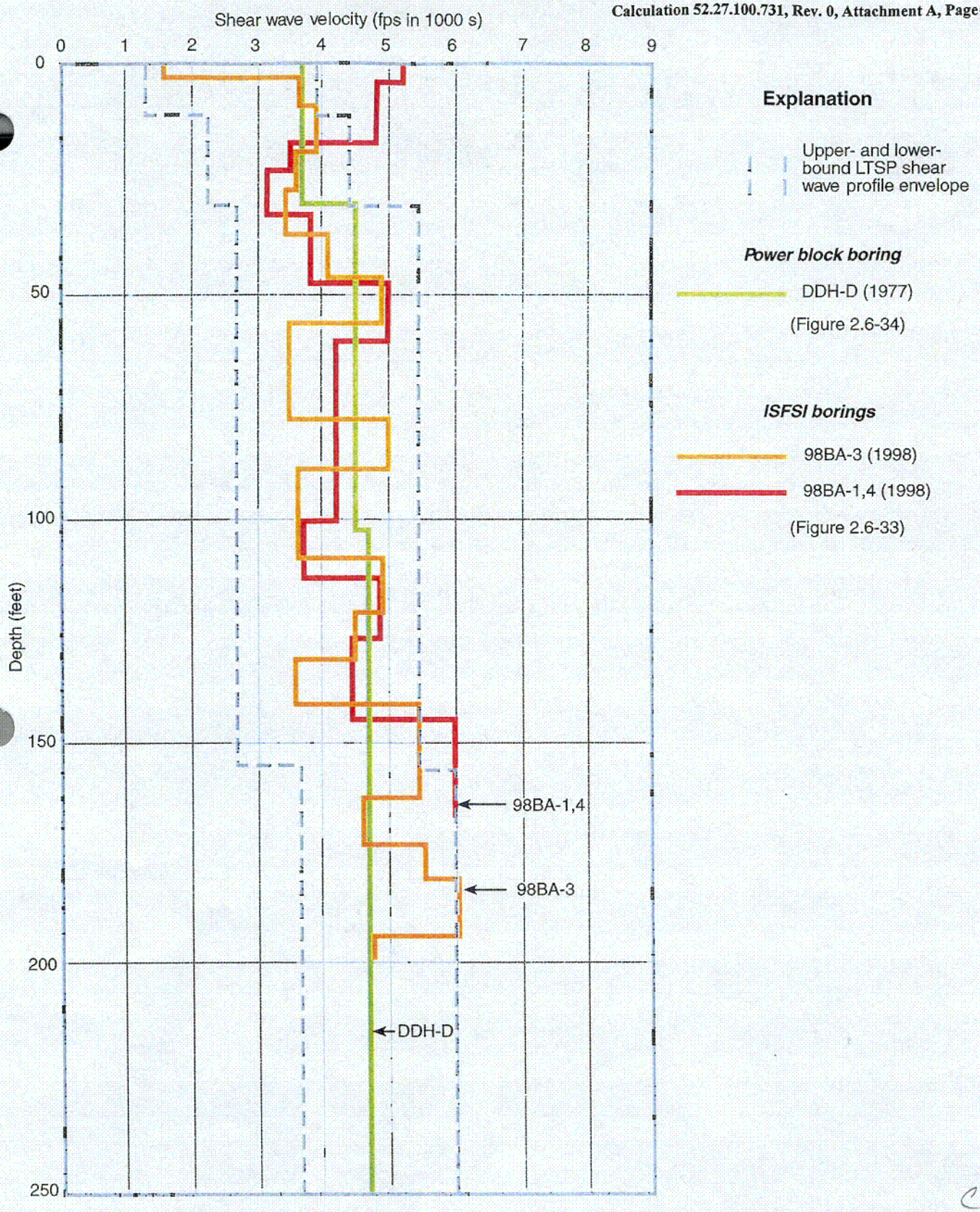

C31

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FIGURE 21-45
COMPARISON OF SEISMIC SHEAR- WAVE VELOCITIES AT THE POWER BLOCK AND ISFSI SITES

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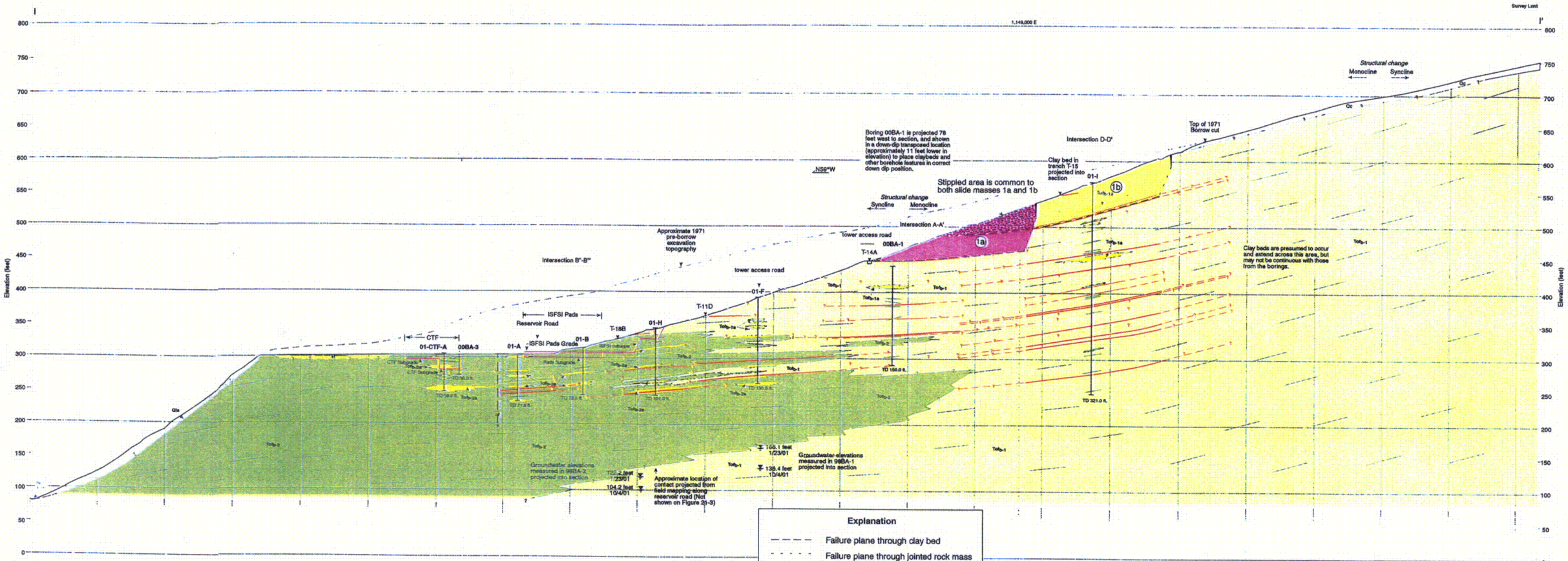

Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

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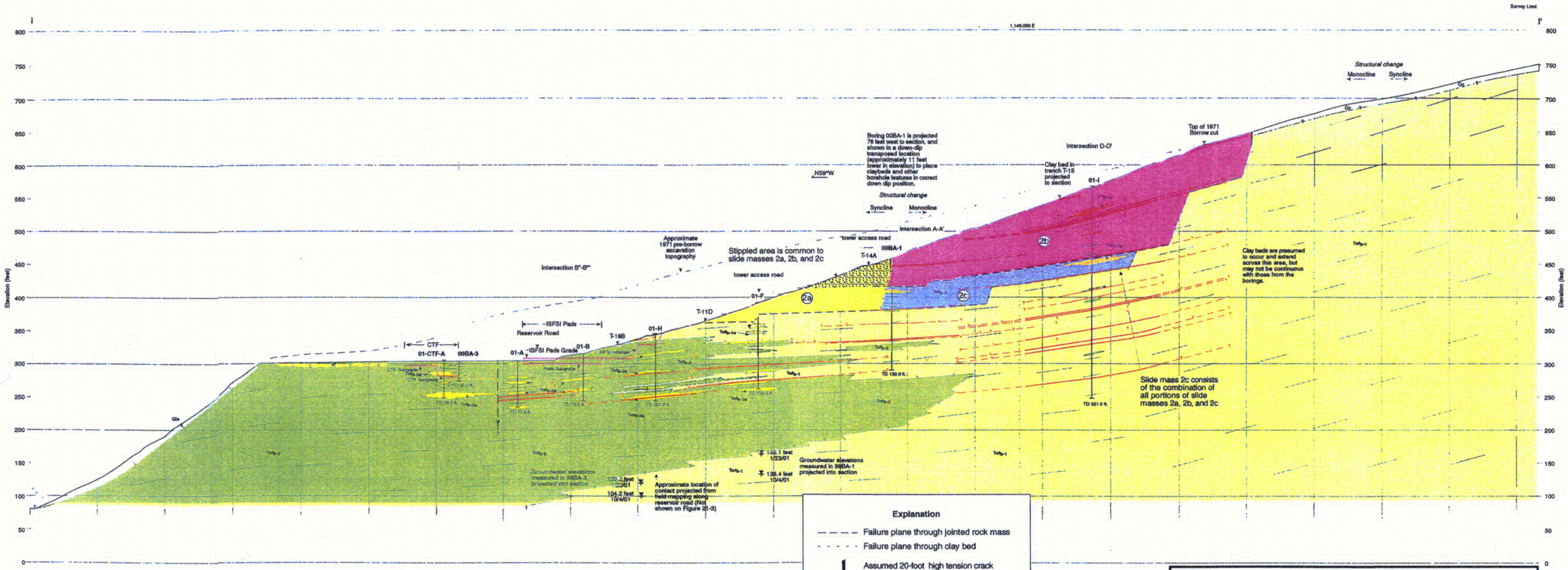
FIGURE 21-46
SLIDE MASS MODEL 1

GEO.DCPP.01.21 REV 2 December, 2001

C32



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

0 25 50 75 100 feet
Scale

Explanation

- Failure plane through jointed rock mass
- Failure plane through clay bed
- Assumed 20-foot high tension crack at top of slide mass

Alternative Slide Mass Models

- 2a
- 2b
- 2c

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FIGURE 21-47
SLIDE MASS MODEL 2

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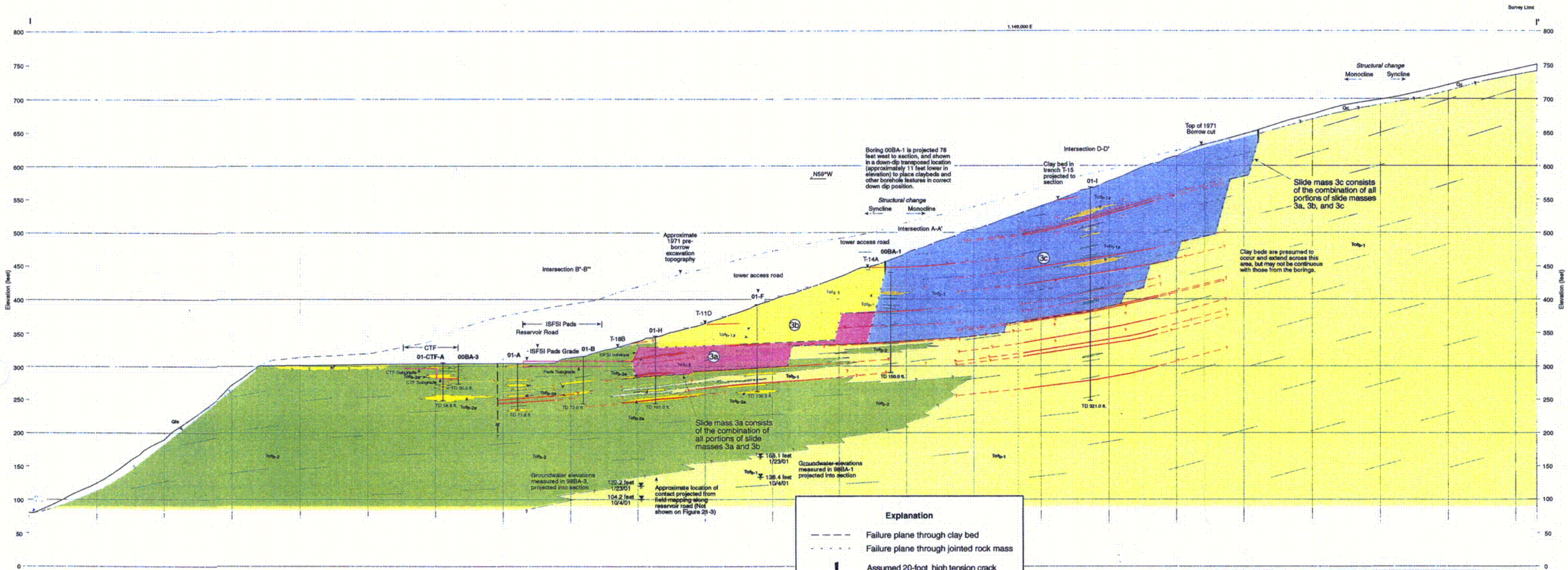
C33



Notes

1. Location of cross section shown on Figures 21-3 and 21-4. Nearby borings are projected to cross section.
2. See Figure 21-13 for explanation of geologic units.
3. Horizontal scale = vertical scale.

0 25 50 75 100 feet
Scale

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FIGURE 21-48
SLIDE MASS MODEL 3

GEO.DCPP.01.21 REV 2 December, 2001

C34