
NRC/PG&E
Communications Meeting
March 1, 2000

Diablo Canyon and Humboldt Bay ISFSIs



Agenda

- Introduction Terry Grebel
- Diablo Canyon ISFSI
 - Current plans and schedules Terry Grebel
 - Geotechnical investigations / seismic design criteria Jearl Strickland
- Humboldt Bay ISFSI
 - Current plans and schedules Roy Willis
 - Probabilistic seismic analysis Lloyd Cluff
 - RFP design criteria Roy Willis
- Future meetings / summary Terry Grebel



Introduction

- Today's meeting is the fifth in a series of Diablo Canyon and Humboldt Bay ISFSI communications meetings that started in June 1998
- Issues addressed in previous meetings have included:
 - The need for high seismic design storage systems
 - Applicable regulatory guidance for license applications
 - Incorporation of material by reference
 - Licensing process and sample sections (demography, meteorology, emergency plan)
 - Plans for development of QA programs
 - Potential exemptions (controlled area boundary, security)

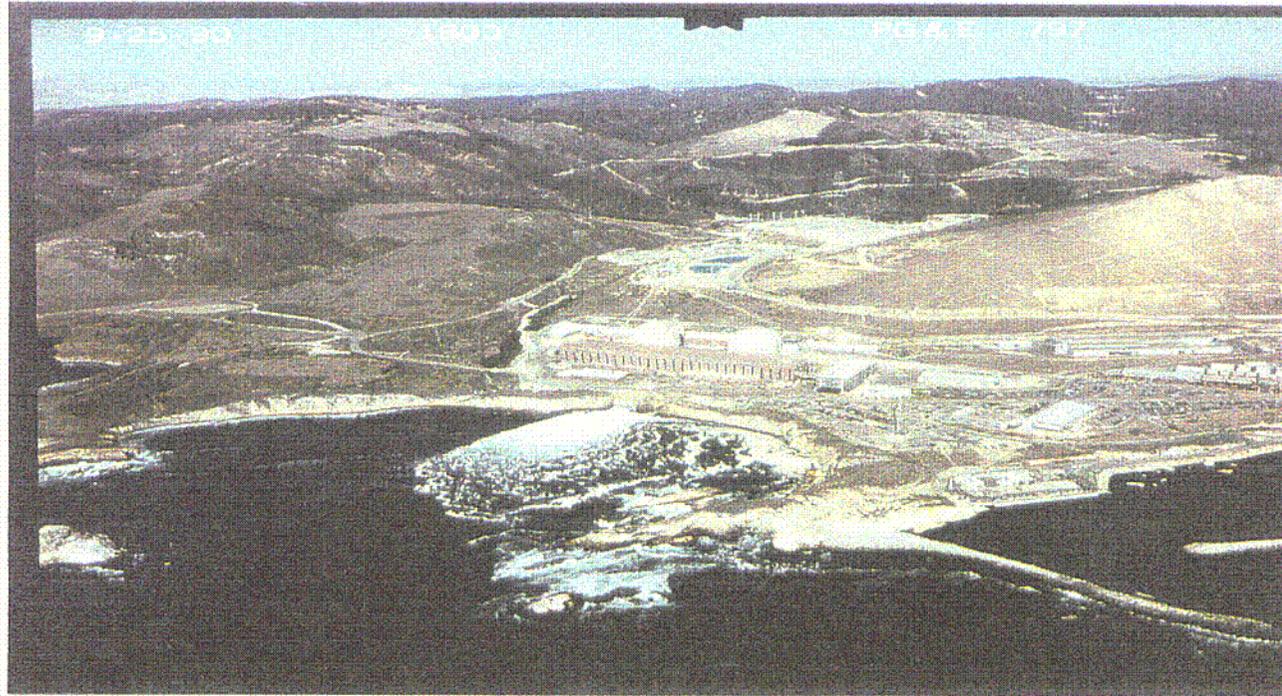


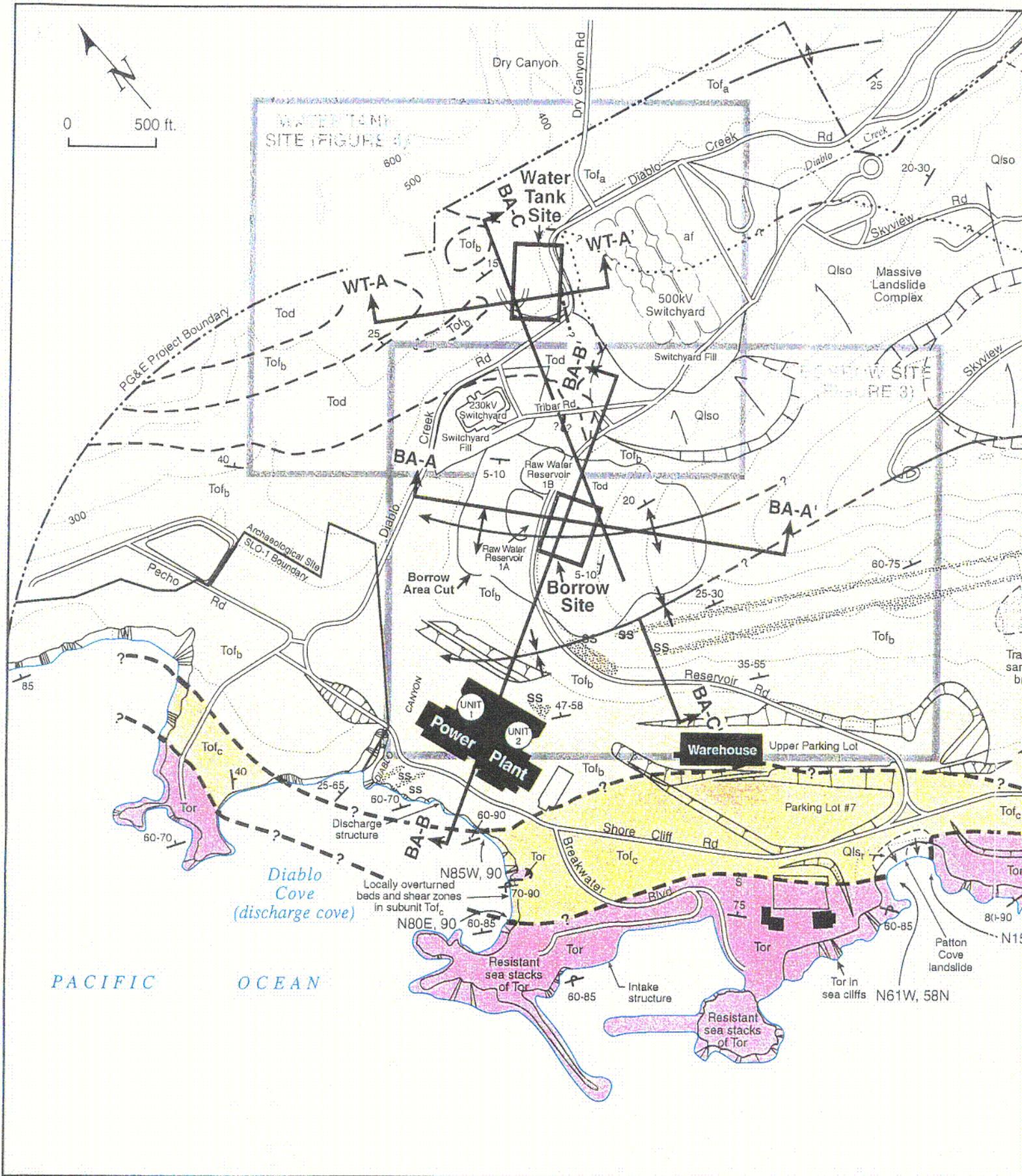
ISFSI Design Approach

- Geotechnical Site Investigation
- Selected Site
- Seismic Design Approach

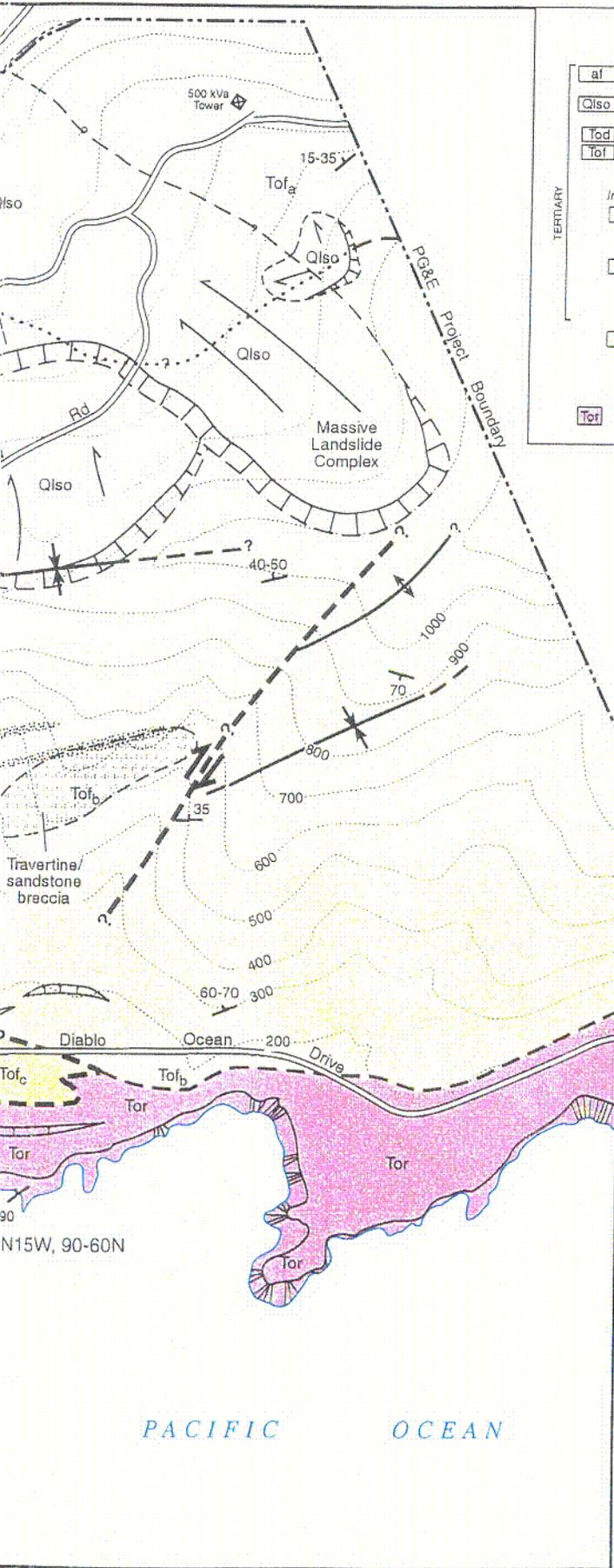


DCPP SITE





C-2



Explanation of geologic map units

- af** - Thick fill
 - Qlso** - Quaternary landslide deposits
 - Tof** - Volcanic rocks (middle Miocene), diabase intrusive sills and basalt flows
 - Tof** - Obispo Formation (lower and middle Miocene) bedded dolomitic sandstone siltstone and claystone with tuffaceous beds, locally calcareous, some chert and volcanic rock lenses
- Informal subunits within Obispo Formation (Tof)**
- a** - Siltstone and sandy siltstone; yellow-brown to tan; thick to massive bedding; locally calcareous and diatomaceous; low to moderate hardness; low to moderate density; very low to low shear wave velocity; very blocky to blocky
 - b** - Dolomitic sandstone, sandy siltstone, and dolomite; gray, yellow-brown, brown; medium to dolomitic sandstone, very thick bedding; moderately hard to hard; medium density; calcite and quartz veins local chert and limestone; moderate shear wave velocity; very blocky to blocky.
 - c** - Claystone, siltstone and shale; dark gray to tan; very thin to medium bedding (turbidite); low to moderate hardness; medium density; some carbonaceous and sheared beds; locally steep and overturned bedding; low shear wave velocity; very blocky to blocky with crushed zones and shears
- Tor** - Obispo Formation (lower and middle Miocene) resistant zeolitized tuff; massively bedded; hard

Explanation for map symbols

- Geologic bedrock contact, solid line where well-defined, dashed where approximate, queried and/or dotted where uncertain
- Cut or fill slope
- Large landslides in the vicinity of Dry Cask sites. Smaller landslides are not shown. Arrows indicate direction of movement, hachures define head scarp region
Qlso - Older, dormant slide
Qlsr - Recent or active slide
- Generalized regional strike and dip of bedding
- Axis of anticline (in bedrock)
- Axis of syncline (in bedrock)
- Bedrock shear zone (inactive); dashed where approximate or buried
- Contour interval in feet
- Resistant sandstone beds and outcrops in sub-unit Tof_b
- Cut area in Tof_b bedrock (Borrow Site)
- Steep sea cliff
- Geologic section

Note: Only major geologic structures and bedrock units are shown. More detailed 1:2,400 scale maps showing Quaternary, bedrock geology, and landslides are in PG&E files.

Data sources

Base Map: PG&E Civil Site Facilities Layout Plan (modified 1994)
 Compilation from air photos PG&E Flight 753A, 1987 (scale 1:7,200)
 Geology modified from Hall (1973)

PG&E DIABLO CANYON POWER PLANT
 Dry Cask Storage Facility Siting Study 1998

Index Map and General Bedrock Geology



FIGURE 2



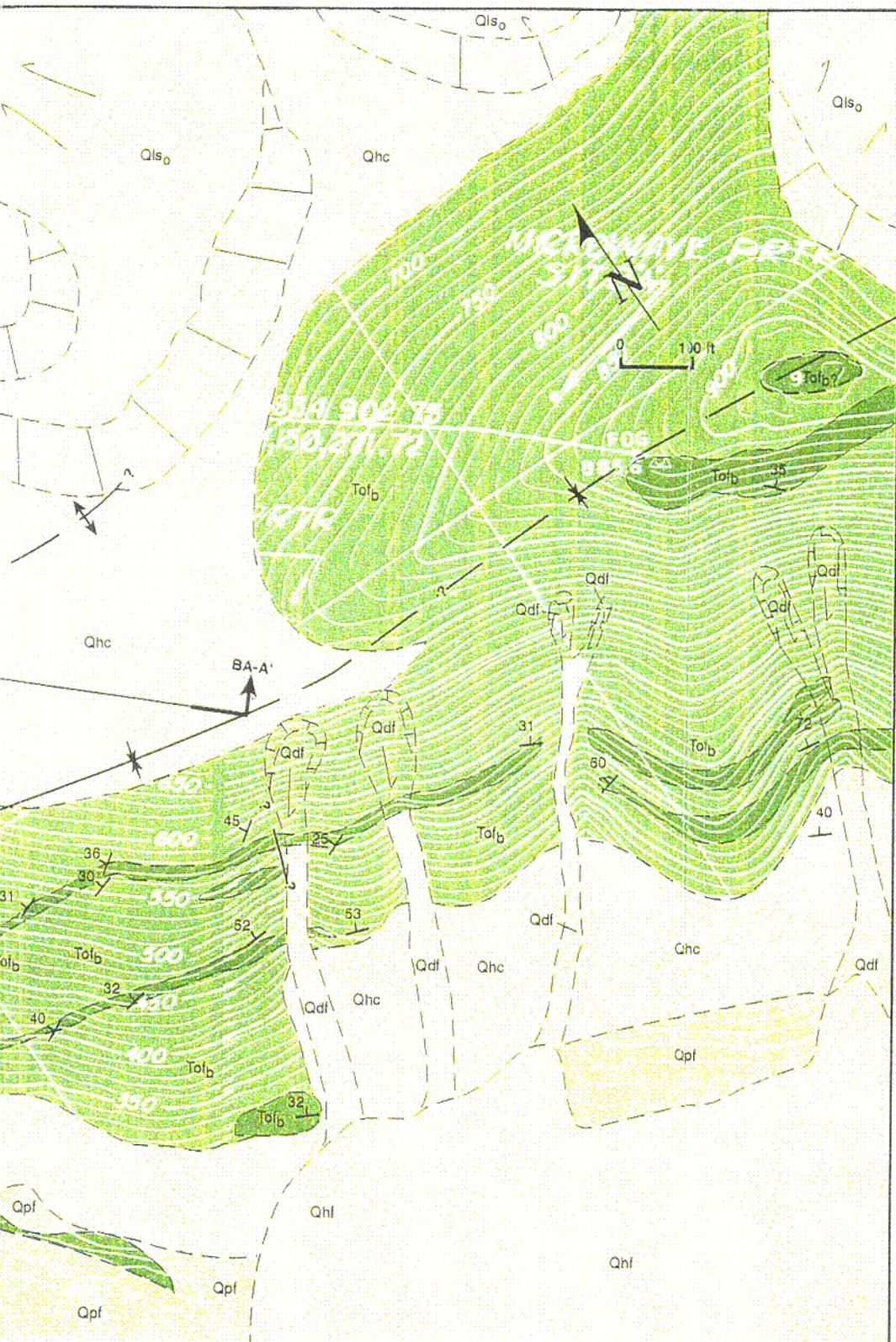
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- af
Qal, Qdf, Qhc, Qls, Qhf
 Holocene deposits, artificial fill, alluvium, debris flow, colluvium, landslide, alluvial fan
- Qpt_m
 Quaternary marine terrace deposit (inferred)(Pleistocene)
- Qpf
 Quaternary fan deposit (Pleistocene)
- Tod
 Tertiary diabase intrusives (middle Miocene)
- Tol_b
 Tertiary Obispo Formation (lower and middle Miocene)

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N
in



Explanation	
	Geologic contact, solid line where well-defined, dashed where approximate, queried where uncertain
	Outline of Borrow Cut
	Landslides in the vicinity of Dry Cask sites. Smaller landslides are not shown. Arrows indicate direction of movement, hachures define head scarp region
	Qls ₀ - older dormant slide
	Qls ₁ - Recent or active slide
	Qdf - Debris flow scar and deposit
	Syncline, trace and plunge of crest, dashed where approximate, queried where uncertain
	Anticline, trace and plunge of crest, dashed where approximate, queried where uncertain
	98C-1, 98BA-40 Mapping observation stations
	Outline of 1971 borrow and reservoir excavations
	285' Marine wave cut platform shoreline angle location and elevation.
	Footprint of 500kV tower
	10 Generalized strike and dip of bedding
	85' Strike and dip of bedrock fault
	Bedrock fault (inactive); dashed where approximate or buried, queried where uncertain
	Boring location: from previous HLA studies
	Borings from 1998 WLA study and 1977 boring DDH-D at power block
	Borings from 1967 power block study
	BA-2 Seismic refraction line (Appendix E)
	BA-C BA-C' Geologic section
	Cut slope area for pad preparation

Explanation of geologic map units

Bedrock Unit Descriptions	
TERTIARY	Tod - Volcanic rocks (middle Miocene), diabase intrusive sills and basalt flows
	Tof - Obispo Formation (lower and middle Miocene) bedded dolomitic sandstone, siltstone, and dolomite with tuffaceous beds, locally calcareous, some chert and volcanic rock lenses
	<i>Informal subunits within Obispo Formation (Tof)</i>
	b - Dolomitic sandstone to dolomite; gray, yellow-brown, brown, and bluish gray; medium to very thick bedding, some units massive; moderately hard to hard; medium density; calcite and quartz veins; moderate shear wave velocity; very blocky to blocky.

NOTE: Darker colors indicate outcrop areas

PG&E DIABLO CANYON POWER PLANT
Dry Cask Storage Facility Siting Study 1998

Geologic Map of the Borrow Site

WLA

FIGURE 3

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Site Investigation Activities

- 15 potential sites considered
- 5 potential sites evaluated
- Geologic and Geophysical Investigations Performed
 - Geologic mapping
 - Collection and classification of samples
 - Exploratory Borings
 - Borehole seismic velocity surveys
 - Bedrock characterization and stability assessment
 - Evaluation of site seismic response



Site Investigation Activities

- Borrow site area identified as preferred location
 - Source of rock for switchyards
 - No soil overburden
 - Underlain by dolomitic sandstone similar to bedrock beneath the plant site
 - No significant geological hazards
 - Based on borehole geologic and geophysical data, seismic response characteristics are similar to the plant site
 - Approved seismic design criteria for plant site is applicable for ISFSI site



ISFSI Seismic Criteria

- Part 50 license requirements for the plant specify 4 Design Basis Earthquakes
 - Design Earthquake (DE)
 - Double design Earthquake (DDE)
 - Hosgri
 - Long Term Seismic Program (LTSP)
- Part 72 license requirements for the ISFSI allow use of an enveloped site specific seismic input



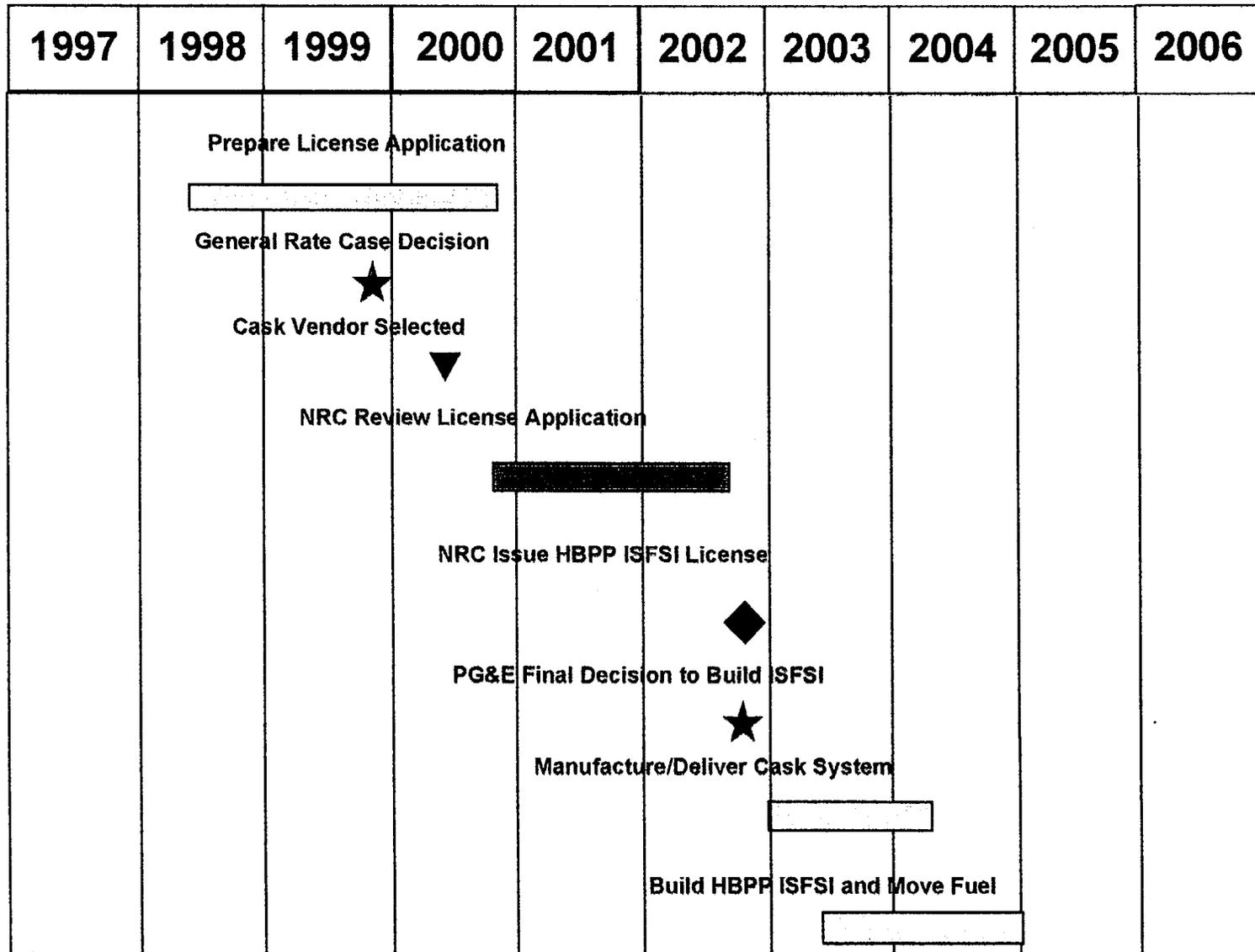
ISFSI Seismic Criteria

- Simplified Licensing Approach ISFSI SSC's
 - Design to both Part 50 and 72 seismic requirements.
 - Individual seismic input and acceptance criteria
 - DE spectra with 2% damping
 - DDE spectra with 2% damping
 - Hosgri spectra with 4% damping
 - LTSP spectra with 5% damping*

*DDE acceptance criteria



Preliminary Schedule for Humboldt Bay ISFSI



Proposed/ Probabilistic Approach

- PG&E proposes to use probabilistic analysis methods for evaluating:
 - Loading of fuel into casks in the refueling building
 - Transport of loaded casks from the refueling building to the ISFSI pad
- No public health or safety issues (offsite doses well within 10 CFR 100 limits for release of noble gas from all 390 fuel assemblies)



Basic Probabilistic Concept and Basis

- Conduct a probabilistic seismic hazard analysis
 - Seismic source characterization (sizes, locations, and rates of earthquakes)
 - Ground motion attenuation relations (strength of shaking)
- Determine the exposure period for short term activities
 - Time for cask loading and transportation
- Select appropriate probability level



Geologic Hazards

- Ground shaking
 - Deterministic MCE for cask storage
 - Probabilistic for cask loading and transportation
- Tsunami
 - Deterministic for cask storage
- Fault Rupture
 - Deterministic using Chilungpu analog
- Liquefaction
 - Avoid liquefiable areas



Source Characterization

- PG&E/CHSU seismic hazard study
 - Developed updated seismic source models for Eureka
- Key earthquake sources
 - Little Salmon thrust system (Little Salmon, Bay Entrance, Buhne Point)
 - Cascadia subduction zone
 - Gorda plate (offshore)
- Chilungpu fault (Taiwan) used as an analog
 - hanging wall deformation



Ground Motion Attenuation

- Three types of earthquakes impact hazard at HBPP
 - Crustal thrust faults (Little Salmon)
 - Subduction (Cascadia)
 - Offshore Gorda plate
- Chi-Chi earthquake
 - Large data set for near fault ground motions (10 recordings within 3 km of the fault)
 - Evaluate impact on attenuation relations



Appropriate Probability Level

- Risk to public safety
 - Due to age and small amount of fuel, analysis shows no unacceptable offsite dose
- Uniform building code
 - Uses 10% chance of exceedance during the exposure period (50 years for buildings)
- Selected probability level
 - 1% chance during exposure period (10 times less likely than the building code level)



Humboldt Bay ISFSI - RFP Design Criteria

- Request for proposal to storage system vendors to be issued in early March
- The RFP will include required design information for the ISFSI storage system and pad



Future Meetings

- **Selected storage system vendor Issues**
 - **Status of generic applications and potential revisions**
- **Discuss status and other potential licensing issues, as necessary and appropriate**

