

- EXPLANATION**

GEOLOGIC UNITS AND ASSOCIATED GEOTECHNICAL CONDITIONS ALONG PIPELINE ROUTE

GEOLOGIC UNITS SHOWN ON BASE MAP:

 - Qal** ALLUVIUM: UNCONSOLIDATED SAND, SILT, CLAY AND GRAVEL; MAY CONTAIN LOOSE SILT-SAND LAYERS WHICH MAY BE POTENTIALLY LIQUEFABLE UNDER HIGH GROUNDWATER CONDITIONS DURING SEISMIC EVENTS.
 - Qcal, Qyf, Qylo, Qc, Qof** OLDER ALLUVIUM, FAN DEPOSITS, TERRACE DEPOSITS: MIXTURE OF SAND, SILT, CLAY AND GRAVEL, RELATIVELY MORE CONSOLIDATED THAN YOUNGER ALLUVIUM; SHOULD PROVIDE ADEQUATE FOUNDATION.
 - Qls** LANDSLIDE DEPOSITS: INCLUDES LANDSLIDES ASSOCIATED WITH FRANCISCAN COMPLEX MELANGE, SERPENTINE, PETALUMA FORMATION CLAYSTONES, AND SONOMA VOLCANICS TUFF.
 - QTge, Qthg, Qlget** GLEN ELLIEN FORMATION AND HUICHICA FORMATION: FLUVIAL DEPOSITS OF GRAVEL, SILT, SAND AND CLAY WITH INTERBEDDED TUFF, RELATIVELY MORE CONSOLIDATED THAN ALLUVIUM; STRONG; SHOULD PROVIDE ADEQUATE FOUNDATION.
 - Tp, Tpc** PETALUMA FORMATION: MASSIVE CLAYSTONE, SILTSTONE, AND MUDSTONE WITH LENSES OF FRIABLE SANDSTONE AND PEBBLE CONGLOMERATE, AND THIN INTERBEDS OF FOSSILIFEROUS LIMESTONE, CLAYSTONE, MUDSTONE/SILTSTONE POTENTIALLY UNSTABLE ON HILLSIDE SLOPES; SOILS DERIVED FROM Tp ARE GENERALLY HIGHLY EXPANSIVE.
 - Tm** WILSON GROVE FORMATION (FORMERLY MERCED FORMATION): SILTSTONE, SANDSTONE, CONGLOMERATE, LIMESTONE CONCRETIONS, TUFF; LOCALLY MASSIVE AND DIFFICULT TO TRENCH EXCAVATE; SHOULD PROVIDE STRONG FOUNDATION.
 - Tsa, Tsr, Tsb** SONOMA VOLCANICS: UNDIFFERENTIATED VOLCANICS AND/OR SEDIMENTARY ROCKS; INCLUDES ANDESITE (Tsa), RHYOLITE (Tsr), BASALT (Tsb), TUFF AND OTHER PYROCLASTIC ROCKS; TUFFACEOUS UNITS ARE POTENTIALLY UNSTABLE ON HILLSIDE SLOPES; LOCALLY MASSIVE ANDESITE, RHYOLITE AND BASALT ROCK UNITS MAY BE DIFFICULT TO EXCAVATE.
 - Klgs** GREAT VALLEY SEQUENCE: UNDIFFERENTIATED MARINE MUDSTONE, SANDSTONE, SILTSTONE AND CONGLOMERATE; MAY LOCALLY CONTAIN HARD MASSES OF SANDSTONE AND CONGLOMERATE THAT MAY BE DIFFICULT TO EXCAVATE; SHOULD PROVIDE STRONG FOUNDATION.
 - KJfs, KJfss, KJfm** FRANCISCAN COMPLEX: INCLUDES MELANGE, A CHAOTIC MIXTURE OF FRAGMENTED ROCK MASSES IN A SHEARED SHALY MATRIX; INCLUDES COHERENT BLOCKS OF SANDSTONE, SHALE, CONGLOMERATE, CHERT (ch), GREENSTONE (gs), SERPENTINIZED ULTRAMAFIC ROCKS (up), METAGRAYWACKE AND BLUESCHIST, ASSOCIATED WITH EXTENSIVE LANDSLIDING IN THE GEYSERS AREA; POTENTIALLY UNSTABLE ON HILLSIDE SLOPES; INCLUDES HARD ROCK MASSES IN MELANGE THAT MAY BE DIFFICULT TO EXCAVATE.

SURFICIAL DEPOSITS NOTED DURING SITE RECONNAISSANCE:

 - Qc** COLLUVIUM: THICK SOIL (CLAY-SILT-SAND-GRAVEL) AT BASE OF HILLSIDE SLOPES AND AT THE EDGES OF ALLUVIAL VALLEYS; SHOULD PROVIDE ADEQUATE FOUNDATION.
 - Qf** FILL: MOSTLY THICK ROAD EMBANKMENT FILL.
- POTENTIAL GEOLOGIC/SEISMIC HAZARDS AND SIGNIFICANT ADVERSE GEOTECHNICAL CONDITIONS ALONG PIPELINE ROUTE**

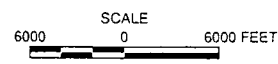
 - FLT** SURFACE FAULT RUPTURE: ACTIVE FAULT CROSSING ALONG THE HEADSBURG, RODGERS CREEK AND MAACAMA FAULT ZONES; BRACKETED SEGMENT COINCIDES APPROXIMATELY WITH BOUNDARY OF ALQUIST-PRIOLO SPECIAL STUDIES ZONE.
 - LQP** LIQUEFACTION POTENTIAL: GENERALLY ASSOCIATED WITH UNCONSOLIDATED SILTY AND SANDY ALLUVIAL DEPOSITS AND SHALLOW GROUND WATER; GENERALLY OCCURS ALONG AND NEAR STREAM CHANNELS AND MARSHY AREAS.
 - SLP** SLOPE INSTABILITY: HILLSIDE AREAS UNDERLAIN BY LANDSLIDE DEPOSITS OR POTENTIALLY UNSTABLE MATERIALS INCLUDING THE FRANCISCAN COMPLEX MELANGE, PETALUMA FORMATION CLAYSTONE, AND SERPENTINE SOILS.
 - ERO** EROSION POTENTIAL: HILLSIDE AREAS UNDERLAIN BY POTENTIALLY ERODIBLE MATERIALS SUCH AS FRANCISCAN COMPLEX MELANGE, PETALUMA FORMATION, AND WILSON GROVE FORMATION.
 - SFT** SOFT FOUNDATION MATERIALS: GENERALLY ASSOCIATED WITH VERY SOFT BAY MUD AND SOFT CLAYEY SOILS IN MARSHY AREAS.
 - HRD** HARD ROCK MATERIALS: MASSIVE SANDSTONE, GREENSTONE, CHERT AND OTHER HARD ROCK MASSES OF THE FRANCISCAN COMPLEX; MASSIVE SILTSTONE/SANDSTONE OF THE GREAT VALLEY SEQUENCE; MASSIVE SANDSTONE AND CONGLOMERATE OF THE WILSON GROVE FORMATION; HARD VOLCANIC ROCKS OF THE SONOMA VOLCANICS WITH ANTICIPATED TRENCH EXCAVATION DIFFICULTY.
 - EXP** EXPANSIVE SOILS: AREAS UNDERLAIN BY SOILS OF THE PETALUMA FORMATION CLAYSTONE, SHEARED SHALE AND CLAY OF THE FRANCISCAN COMPLEX MELANGE; SOILS DERIVED FROM SEVERELY WEATHERED TUFFS OF THE SONOMA VOLCANICS, AND SERPENTINE SOILS.

LEGEND:

 - ALTERNATIVE RESERVOIR STORAGE SITE
 - PIPELINE ROUTE
 - SLP - HAZARD/CONDITION OCCURRING ALONG APPROXIMATE BRACKETED PIPELINE SEGMENT
 - G-1 SC-1 SEGMENT MARKER (DISCUSSED IN TEXT)
 - PS-G4 PUMP STATION (DESIGNATIONS SHOWN ONLY FOR GEYSERS TRANSMISSION PIPELINE)
 - AMERICANO AGRICULTURE (WEST COUNTY)

BASE FROM PRELIMINARY GEOLOGIC MAP OF WESTERN SONOMA COUNTY AND NORTHERNMOST MARIN COUNTY, BLAKE AND OTHERS, 1971; PRELIMINARY GEOLOGIC MAP OF EASTERN SONOMA COUNTY AND WESTERN NAPA COUNTY, FOX AND OTHERS, 1973; PRELIMINARY GEOLOGIC MAP OF MARIN AND SAN FRANCISCO COUNTIES AND PARTS OF ALAMEDA, CONTRA COSTA, AND SONOMA COUNTIES, BLAKE AND OTHERS, 1973; PRELIMINARY GEOLOGIC MAP OF SOLANO COUNTY, AND PARTS OF NAPA, CONTRA COSTA, MARIN AND YOLO COUNTIES, SIMS AND OTHERS, 1973.

- NOTES
1. PIPELINE ALIGNMENTS PROVIDED BY PARSONS ENGINEERING SCIENCE.
 2. ONLY PROPOSED ALTERNATIVE TRANSMISSION PIPELINE ALIGNMENTS ARE SHOWN. EXISTING PIPELINES WHICH SUPPLY SOME OF THE PROPOSED PIPELINES ARE NOT SHOWN.
 3. POTENTIAL HAZARDS AND GEOTECHNICAL CONDITIONS SHOWN ARE BASED ON REVIEW OF AVAILABLE PUBLISHED DATA AND SITE RECONNAISSANCE CONDUCTED ON OCTOBER 4-5, 1995.



RUST ENVIRONMENT & INFRASTRUCTURE

San Jose, California

GEOLOGIC MAP SHOWING POTENTIAL GEOLOGIC/SEISMIC HAZARDS PIPELINE ROUTES - SOUTH

SANTA ROSA SUBREGIONAL LONG TERM WASTEWATER PROJECT

PROJECT NO. 88230

DATE OCTOBER 1995

FIGURE NO. 9-1