GEOTECHNICAL DATA REPORT

Napa-Sonoma Salt Marsh Restoration Pipeline

Napa and Sonoma Counties, CA

Prepared by:

BLACKBURN CONSULTING
11521 Blocker Drive, Suite 110
Auburn, CA 95603
(530) 887-1494

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Prepared for:

Camp Dresser & McKee, Inc.

PROFESSIONAL GEOLOGIST
PATRICK F. FISCHER
No. 1739
CERTIFIED ENGINEERING GEOLOGIST
CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
THOMAS W. BLACKBURN
No. 2311
Exp. 6/30/12
GEOTECHNICAL
STATE OF CALIFORNIA

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TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Purpose 1
1.2 Scope of Evaluation 1
2 SITE AND PROJECT DESCRIPTION 1
2.1 Site Location and Description 1
2.2 Project Description 2
3 EXISTING DATA 2
4 FIELDWORK AND LABORATORY TESTING 3
4.1 Exploratory Borings 3
4.2 Laboratory Testing 6
5 SITE CONDITIONS 6
5.1 Regional Geology 6
5.2 Project Geology 6
5.2.1 Faulting 7
5.3 Subsurface Soil Conditions 8
5.4 Groundwater 9
5.5 Existing Pavement Sections 12
6 LIMITATIONS 13

FIGURES:
Figure 1: Vicinity Map
Figure 2: Site Map
Figure 3: Geologic Map
Figure 4: Regional Fault Map

APPENDIX A: Existing Report Boring Logs
-Taber, 2000, Sonoma Valley CSD Reclamation Ponds R1 & R2
(Title Pages, Logs B-10 to B-14, and Location Map)
- Taber, 2000, Sonoma Valley CSD Effluent Reservoir R-4
(Title Pages, Logs P-1A/B, P-2B, B-1, B-7 to B-9, B-11, B-12, and Location Map)

APPENDIX B: Boring Location Map, BCI 2011; Sheets 1 through 16

APPENDIX C: Boring Logs (BCI 2011); B1, B2, and B4 through B37
Legend of Boring Logs
Trenchless Crossing Profiles (Stations 22+00, 39+00, 157+50, 225+00, 234+00, 336+00, 443+00)
Well Construction Details – Well B5, B21, B28, and B36

APPENDIX D: Field and Laboratory Testing Summary (Sheets 1-5)
Laboratory Test Results

APPENDIX E: Groundwater Elevation Maps
- Sonoma Valley, USGS (2006), 1980 and 2003 water levels

LIST OF ABBREVIATIONS USED

AC	Asphaltic Concrete
AB	Aggregate Baserock
Af	Artificial Fill
Alf	Artificial Levee Fill
ASTM	American Society for Testing and Materials
BCI	Blackburn Consulting
bgs	Below the ground surface
CDM	Camp Dresser & McKee, Inc.
CSD	County Sanitation District
CTM	California (Caltrans) Test Method
DWR	California Department of Water Resources
ft	Feet
GPS	Global Positioning System
I.D.	Inside Diameter
MC	Modified California Sampler
msl	Mean Sea Level
NAD	North American Datum
NSMWA	Napa-Sonoma Marshes Wildlife Area
NWPRA	Northwestern Pacific Railroad Authority
O.D.	Outside Diameter
Ph	Huichica Formation
Qha	Alluvium, undivided
Qhbm	Bay Mud
Qhc	Stream Channel Deposits
Qof	Older Alluvial Fan Deposits
SCWA	Sonoma County Water Agency
SPT	Standard Penetration Test
SVCSD	Sonoma Valley County Sanitation District
USGS	United States Geological Survey
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (BCI) prepared this Geotechnical Data Report for the Sonoma Valley County Sanitation District's (SVCSD) Napa-Sonoma Salt Marsh Restoration Pipeline. The purpose of this report is to present available geotechnical and geologic data for the project.

1.2 Scope of Evaluation

BCI completed the following:

- Discussed the project with Camp Dresser & McKee, Inc. (CDM) and reviewed project information provided by CDM, including preliminary plan and profile sheets and general project descriptions
- Reviewed subsurface information provided by SVCSD for SVCSD reservoirs located adjacent to portions of the alignment
- Observed, logged, and sampled 36 borings to depths ranging from 10 to 50 feet below ground surface (bgs)
- Installed 4 groundwater observation wells along the alignment
- Reviewed published geologic mapping
- Performed laboratory tests on soil samples obtained from the exploratory borings
- Prepared logs of the borings

2 SITE AND PROJECT DESCRIPTION

2.1 Site Location and Description

The proposed pipeline project is located in an unincorporated area of Napa and Sonoma Counties. Figure 1 shows the general project location; a more detailed alignment location is shown on Figure 2.

The pipeline begins north of the town of Schellville, in Sonoma County, at the SVCSD wastewater treatment plant (WWTP) near the intersection of 8th Street and Imperial Drive (approximate latitude 38.2511, longitude 122.4410). It then runs southeast, approximately 43,000 feet, into Napa County and terminates at Buchli Station Road (approximate latitude 38.2149, longitude 122.3319).

The alignment is located within the valley floor and low foothills of eastern Sonoma Valley. Topography along the alignment ranges from a low of approximately 5 feet above mean sea level (msl) at the northwestern portion to a high of approximately 100 feet along the southeastern portion of the alignment. Topography is relatively flat, where crossing the valley floor, to moderately sloping. Figure 2 shows overall topography in the area of the alignment.

Most of the pipeline alignment follows existing roadways and unimproved (dirt) roadways. A portion of the alignment is cross country (at Schell Creek). Major drainage crossings include

Schell Creek/Slough at the west portion of the alignment and Huichica Creek at the eastern portion. The alignment crosses several other intermittent drainages and crosses railroad embankment at several locations. Figure 2 shows major roadways and drainages along the alignment.

2.2 Project Description

Project information provided by CDM indicates that the California Coastal Conservancy, U.S. Army Corps of Engineers, and California Department of Fish and Game are implementing a salinity reduction and habitat restoration project for the 9,460-acre Napa River Unit of the Napa-Sonoma Marshes Wildlife Area. The Napa River Unit is located at the northeast edge of San Pablo Bay, adjacent to the Napa River. The purpose of the Napa River Salt Marsh Restoration Project is to restore habitat, including tidal habitat and managed ponds, and provide for better management of ponds in the Napa River Unit to support populations of fish and wildlife.

The restoration project includes the annual delivery of approximately 2,000 to 3,000 acre feet of tertiary recycled water from the SVCSD as an ongoing supply of non-saline water for restoration, and subsequent agricultural use. SVCSD will construct a pipeline (this project) to provide recycled water to ponds for habitat enhancement. The proposed facilities for the project include:

- Design and construction of new pipeline from the existing SVCSD WWTP to the existing SVCSD storage reservoirs located near the intersection of the Northwestern Pacific Railroad Authority (NWPRA) and Ramal Road, which includes approximately 3.5 miles of new 18-inch pipeline parallel to an existing 18-inch pipeline between the WWTP junction structure and the existing storage reservoirs.
- Approximately 4.5 miles of 18 to 24-inch pipeline from the reservoirs to the salt ponds at the east end of the project. From the reservoirs, approximately 0.25 miles of pipeline would be installed north along an access road to Ramal Road. The alignment would then extend 1.75 miles east along Ramal Road. At that point, the pipeline transverses Huichica Creek and runs east along an agricultural access road for approximately 1.25 miles to Buchli Station Road. The pipeline will then run south on Buchli Station Road for approximately 1.25 miles until it reaches the Huichica Creek entrance of the Napa-Sonoma Marshes Wildlife Area (NSMWA).

Typical cover over the pipe will be on the order of 3 to 5 feet. Trenchless installation methods may be used at the intersection of 8th Street and Fremont Blvd (State Route 12/121), creek and drainage crossings, and railroad crossings; otherwise, the pipeline will be an open cut installation. Figure 2 shows the approximate location of planned trenchless installations.

3 EXISTING DATA

The following is known subsurface information near the alignment completed by others and provided by SVCSD:

- Report by Taber (2000), Geotechnical Evaluation, Sonoma Valley CSD Reclamation Ponds R1 & R2, Sonoma County, California; includes logs of borings and CPT probes

for reservoir design/construction exploration. Located near project Stations 208+00 to 233+00.

- Report by Taber (2000), Geotechnical Investigation, Sonoma Valley CSD Effluent Reservoir R-4, Sonoma County, California; includes logs of borings for reservoir design/construction exploration. Located near project Stations 161+00 to 181+00.

Appendix A contains a copy of applicable exploration boring logs (borings near the alignment) from these reports. The entire report can be obtained from SVCSD for further reference.

4 FIELDWORK AND LABORATORY TESTING

BCI completed the following field exploration tasks:

- Reviewed the pipeline alignment to evaluate the mapped geology
- Drilled and sampled exploratory borings along the proposed pipeline alignment
- Installed four groundwater observation wells
- Completed laboratory testing on representative soil samples

4.1 Exploratory Borings

BCI drilled and sampled 36 exploratory borings between September 30 and April 4, 2011. Boring depths range from 10 to 50 feet bgs. Completed borings are Borings B1, B2, and B4 through B37. Planned Boring B3 was not completed due to utility conflicts.

BCI planned the general depth of the borings based on the proposed pipeline depth, anticipated soil conditions, and the location of existing utilities (Borings 6 through 9 are located several hundred feet south of the alignment to avoid existing SVCSD lines that could not be accurately located by SVCSD).

Table 1 lists the approximate locations and depths of the borings. Figure 2 and Sheets 1 through 16 in Appendix B show the boring locations. Boring logs are attached in Appendix C along with profiles at most expected trenchless crossing locations.

TABLE 1

BCI EXPLORATION LOCATION SUMMARY				
Boring No.	**General Location**	**Approximate Station Number[1]**	**Approx. Elevation (ft)[1]**	**Boring Depth (ft)**
B1	8th Street	19+50	18.0	38.0
B2	8th Street	23+13	18.0	16.5
B3	Not drilled - utility conflicts	---	---	---
B4	8th Street and Fremont Drive	37+50	16.0	16.5
B5	8th Street and Fremont Drive	39+96	17.0	21.5
B6	Access South of Fremont Dr.	56+72 (430 feet south of alignment)	12.0	16.5
B7	Schell Creek	69+24 (300 feet south of alignment)	8.0	51.5
B8	Schell Creek	70+06 (315 feet south of alignment)	8.0	51.5
B9	Schell Creek to Railroad	77+00 (230 feet south of alignment)	6.0	26.5
B10	Railroad alignment	91+06	7.5	21.5
B11	Railroad alignment	99+74	8.5	11.5
B12	Railroad alignment	116+42	9.5	16.5
B13	Railroad alignment	126+98	12.0	11.5
B14	Railroad alignment	135+90	14.5	11.5
B15	Railroad alignment	145+96	15.0	11.5
B16	Railroad alignment	157+08	13.0	21.5
B17	Railroad alignment/Ramal Rd	171+90	13.5	26.5
B18	Railroad alignment/Ramal Rd	188+56	12.5	21.5
B19	Railroad alignment/Ramal Rd	199+70	13.5	16.5
B20	Railroad alignment/Ramal Rd	224+40	13.0	31.5
B21	Railroad alignment/Ramal Rd	233+42	12.5	16.5
B22	Ramal Road	248+28	30.0	11.5
B23	Ramal Road	265+56	38.0	16.5
B24	Ramal Road	277+74	58.0	11.5
B25	Ramal Road	292+90	47.0	16.5

BCI EXPLORATION LOCATION SUMMARY				
Boring No.	**General Location**	**Approximate Station Number[1]**	**Approx. Elevation (ft)[1]**	**Boring Depth (ft)**
B26	Ramal Road	303+12	58.0	11.5
B27	Ramal Road	313+04	50.0	16.5
B28	Ramal Road at Huichica Creek	334+45	20.0	51.5
B29	East side of Huichica Creek	337+89	32.4	21.5
B30	Vineyard Road	342+82	41.5	11.5
B31	Vineyard Road	362+10	61.5	16.5
B32	Vineyard Road	375+50	83.0	11.5
B33	Vineyard Road	388+98	59.0	16.5
B34	Buchli Station Road	400+98	48.5	11.5
B35	Buchli Station Road	415+76	16.0	16.5
B36	Buchli Station Road	427+24	8.5	18.0
B37	NSMWA Parking Lot	434+54	9.0	16.5

[1]Estimated by BCI from preliminary plans provided by CDM (4/20/2011)

BCI's drilling subcontractors (Taber and Precision Drilling) drilled the borings using solid-stem auger (4-inch diameter), hollow-stem auger (8-inch diameter), and rotary wash (4-inch diameter) techniques. Solid –stem or hollow-stem augers were used for drilling most borings (based on equipment availability). Rotary wash drilling was used when we anticipated a potential for loose or "running" sands in the deeper borings.

BCI sampled the soil at various intervals using a 3.0-inch O.D. sampler (equipped with 2.4-inch diameter brass liners) or 2.0-inch O.D., Standard Penetration Test (SPT) sampler (1.4-inch I.D.). Samplers were driven with an automatic hammer (assumed energy efficiency of 75%), weighing 140-pounds and falling approximately 30 inches.

A BCI engineer logged the borings and used plastic caps to seal and label the 2.4-inch diameter, 6-inch long brass tubes retrieved from MC sampling. BCI also retrieved bulk soil samples from auger cuttings, placed this material in large cloth/plastic bags, and labeled them for laboratory identification. The drillers backfilled the borings with cement grout and/or soil cuttings upon completion and spread remaining drill cuttings in adjacent shoulder or field area.

During the field exploration, BCI performed field strength testing with a pocket penetrometer on select cohesive and/or cemented soil samples. Results of field tests are noted on the boring logs.

4.2 Laboratory Testing

In addition to the field Standard Penetration Tests and pocket penetrometer field testing, BCI completed the following laboratory tests on representative soil samples from the exploratory borings:

- Moisture Content (ASTM D 2216) and Unit Weight (ASTM D 2937) for soil classification and in-place soil characteristics
- Plasticity Index (ASTM D 4318) for soil classification and correlations
- Sieve Analysis (ASTM D 422) for soil classification and correlations
- Direct Shear (ASTM D 3080) for soil strength
- Unconfined Compression (ASTM D 2166) for soil strength
- Maximum Dry Density (ASTM D 1557) for compaction characteristics
- Corrosivity Tests (Sulfate - CTM 417, Chloride – CTM 422, pH and Resistivity - CTM 643) to evaluate corrosion potential of soils.

Appendix D contains field and laboratory testing summary sheets and laboratory test results. Moisture-density test results are shown on the boring logs where appropriate.

5 SITE CONDITIONS

5.1 Regional Geology

The project region is located within the Coast Ranges Geomorphic Province. This province consists of northwest-trending mountain ranges and valleys. The ranges and valleys trend northwest, sub parallel to the San Andreas Fault. The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary strata that dip to the east beneath the alluvium of the Great Valley; to the west is the Pacific Ocean. The northern and southern ranges are separated by a broad depression containing the San Francisco Bay, which formed due to east-west expansion (pull-apart) between the San Andreas Fault and the Hayward Fault systems. The northern Coast Ranges, where the project site is located, are dominated by irregular, knobby, landslide topography of the Franciscan Complex and the eastern border is characterized by strike-ridges and valleys in Upper Mesozoic strata. In several areas, Franciscan rocks are overlain by volcanic cones and flows of the Quien Sabe, Sonoma and Clear Lake volcanic fields.

5.2 Project Geology

A Geologic Map is attached as Figure 3 (after Wagner and Gutierrez, 2010)[1]. This map shows the approximate pipeline alignment and area geology. The alignment is primarily underlain by three geologic units, which are:

- Bay Mud (Qhbm)
- Older Alluvial Fan Deposits (Qof)
- Huichica Formation (Ph)

[1] Wagner, D.L., and Gutierrez, C.I., 2010, Geologic Map of the Napa, 30’x 60’ Quadrangle, California; 1:100,000; California Geological Survey

Wagner and Gutierrez (2010) describe these units as follows:

- **Bay Mud (Qhbm; Holocene, less than 10,000 years old)** - Estuarine silt, clay, peat, and fine sand deposited at or near sea level in San Pablo Bay
- **Alluvial fan deposits (Qof; old, early to late Pleistocene age)** - Sand, gravel, silt, and clay, deeply dissected. Topography is moderately rolling with little or no original alluvial surfaces preserved
- **Huichica Formation (Ph; Pliocene age)** - Fluvial gravel, sand, silt, and clay. Sediments derived mostly from Sonoma Volcanics but coarse sand is rich in Franciscan pebbles and cobbles.

Other minor units encountered along the alignment include:

- **Artificial fill (af; Holocene, historic time)** – Constructed fills (road, embankment, etc.) that may be engineered and/or non-engineered. Locally includes artificial dam fill
- **Artificial levee fill (alf; Holocene, historic time)** - Constructed fills (levee) that may be engineered and/or non-engineered
- **Artificial fill placed over bay mud (afbm; Holocene, historic time)** - May be engineered and/or non-engineered
- **Stream channel deposits (Qhc; late Holocene to modern <150 years)** - Deposits in active, natural stream channels. Consists of loose alluvial sand, gravel, and silt
- **Alluvial fan deposits (Qhf; Holocene age)** - Alluvial fan sediments deposited by streams emanating from the mountains as debris flows, hyper-concentrated mudflows, or braided stream flows. Sediments include sand, gravel, silt, and clay, that are moderately to poorly sorted, and moderately to poorly bedded
- **Alluvium, undivided (Qha; Holocene age)** - Alluvium deposited on fans, terraces, or in basins; composed of sand, gravel, silt, and clay that are poorly sorted
- **Alluvial fan deposits (Qpf; latest Pleistocene age)** - Sand, gravel, silt, and clay that is moderately to poorly sorted and bedded. Similar to Holocene fans (Qhf), but more dissected
- **Alluvial deposits (old), undivided (Qoa; early to late Pleistocene age)** - Alluvial fan, stream terrace, basin, and channel deposits

Within the area of the project alignment, expect most sedimentary bedding to be relatively flat lying to gently sloping (several degrees) to the south-southwest.

5.2.1 Faulting

Review of the following maps shows no known faulting mapped across or adjacent to the project alignment:

- Geologic Map of the Santa Rosa Quadrangle[2]
- Geologic Map of the Napa, 30'x 60' Quadrangle [3]
- Fault Activity Map of California and Adjacent Areas[4]

The project alignment is not within or adjacent to an Alquist–Priolo Earthquake Fault Zone (Bryant and Hart, 2007)[5]. BCI did not observe indications of faulting such as lineaments, scarps, springs, etc. along the project alignment during review of aerial photography and field review/alignment exploration.

Figure 4, Regional Fault Map, shows mapped faulting in the project region. The closest faults considered Holocene age (active) are the West Napa Fault located approximately 2.5 miles east of the eastern portion of the alignment, and the Rodgers Creek Fault located approximately 3.6 miles west of the western end of the alignment.

5.3 Subsurface Soil Conditions

Table 2 provides a summary of the general soil conditions observed along the alignment.

TABLE 2

General Soil Conditions along the Pipeline Alignment			
General Location or Segment	**Approximate Station No.* and Borings**	**Mapped Underlying Geology**	**General Subsurface Conditions**
SVCSD WWTP to Schell Creek drainage	10+00 to 70+00 Borings B1 to B6	Alluvial Fan Deposits (old) and Artificial Fill (road)	Hard, lean clay and medium dense to dense clayey sand in the upper 13 to 16 feet, underlain by dense, silty sand and gravel. Some soft clay and sands and gravels (including road fill) in the upper 3 to 5 feet.
Schell Creek drainage	70+00 to 76+00 Boring B7 and B8	Bay Mud	Stiff to very stiff, lean to fat clay in the upper 8 feet, underlain by dense, granular soils (sand, silty sand, and gravel) to a depth of 13.5 to 16 feet. The granular soils are underlain by very stiff to hard, lean clay with some intervening, dense, clayey sands to depths in excess of 50 feet. Expect some soft to medium stiff clays in upper 3 to 5 feet.

[2] Wagner, D.L., and Bortugno, E.J., 1982, Geologic Map of the Santa Rosa Quadrangle, 1:250,000; California Division of Mines and Geology, Regional Geologic Map Series, Map No. 2A
[3] Wagner , D.L., and Gutierrez, C.I., 2010, Geologic Map of the Napa, 30'x 60' Quadrangle, California, 1:100,000; California Geological Survey
[4] Jennings, Charles, 1994, Fault Activity Map of California and Adjacent Areas, 1:750,000; California Division of Mines and Geology, Geologic Data Map No. 6
[5] Bryant, W. A., and Hart, E.W., 2007 (Interim Revision), Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act With Index to Earthquake Fault Zone Maps; California Geological Survey, Special Publication 42

General Soil Conditions along the Pipeline Alignment			
General Location or Segment	**Approximate Station No.* and Borings**	**Mapped Underlying Geology**	**General Subsurface Conditions**
Schell Creek Drainage to Railroad Alignment	76+00 to 96+00 Borings B9 and B10	Transitional from Bay Mud to Alluvial Fan Deposits (old)	Mixture of medium dense to dense sand to clayey sand, and hard, lean to fat clay, sandy clay, and silt.
Railroad Alignment	96+00 to 191+00 Borings B11 to B18 (see Taber Borings in Appendix A also)	Alluvial Fan Deposits	Very stiff to hard, lean clay and silt with sand and gravel to depths in excess of 25 feet. Some intervening, medium dense to dense, sand, silty sand, and gravels (typically at an approximate depth of 15-20 feet).
Railroad Alignment to Ramal Road	191+00 to 250+00 Borings B19 to B22 (see Taber Borings in Appendix A also)	Huichica Formation and Alluvial Fan Deposits	Very stiff to hard, lean clay and silt with sand to depths of 7.5 to 8.5 feet underlain by dense, clayey sand and gravel to depths in excess of 16 feet.
Ramal Road/Duhig Road to Huichica Creek	250+00 to 333+00 Borings B23 to B27	Huichica Formation, Alluvial Fan Deposits, and Artificial Fill (road)	Very stiff to hard, sandy, lean clay and silt to depths in excess of 16 feet.
Huichica Creek	333+00 to 344+00 Borings B28 and B29	Alluvial Deposits (old)	Very stiff to hard, clay, sandy clay and clay with sand to a depth of 37.5 feet. Some dense, clayey sand from 3 to 7.5 feet. Below 37.5 feet, dense sand and gravel with silt and clay.
Huichica Creek to Buchli Station Road and Railroad Alignment	344+00 to 428+00 Borings B30 to B36	Huichica Formation	Very stiff to hard, sandy, lean clay and silt to depths in excess of 16 feet. Some intervening, medium dense to dense, clayey sands.
Railroad Alignment to End of Project	428+00 to 433+88 Boring 37	Transition from Huichica Formation to Bay Mud	Medium stiff to stiff lean clay with gravel and fat clay to depths of up to 7 feet. Underlain by very stiff to hard lean clay.

* Estimated by BCI from preliminary plans provided by CDM (4/20/2011)

Soil conditions and stationing in Table 2 are generalized. Refer to the logs of the borings for further detail. Final boring logs are based on BCI's field logging, geologic mapping, and laboratory testing. BCI located borings by handheld GPS and geographic features shown on the preliminary project mapping.

5.4 Groundwater

Groundwater elevation (hydraulic-head) maps that include the project area have been prepared by the U.S. Geological Survey (2006)[6]. Maps for Autumn (September or October) 1980 and

[6] Farrar et al, 2006, Geohydrologic Characterization, Water-Chemistry, and Ground-Water Flow Simulation Model of the Sonoma Valley Area, Sonoma County, California; Scientific Investigations Report 2006-5092; United States Geological Survey in cooperation with Sonoma County Water Agency

Spring (March or April) 2003 indicate that groundwater can be expected near elevation 0.0 feet along the alignment west of the railroad and up to an elevation of approximately 10.0 feet east of the railroad. Fluctuations of several feet in groundwater elevation due to tidal, seasonal, irrigation, and pumping influences will occur. See the groundwater elevation maps in Appendix E.

Groundwater elevation data is available from the Department of Water Resources (www.water.ca.gov/groundwater/index.cfm) for two wells in the project vicinity. Summarized information for these wells follows:

- Well No. 04N05W02B001M – located north of Ramal Road at elevation 49.2 feet (Latitude: 38.2253, Longitude: -122.3775, NAD 27). Groundwater elevations recorded in 2008-2010 range from 5.4 feet to 13.9 feet (depth of over 35 feet).
- Well No. 05N05W30J003M – located approximately 2000 feet west of the north end of the alignment near Broadway (Highway 12) and at elevation 17.0 feet (Latitude: 38.2494, Longitude: -122.4472, NAD 27). The latest available groundwater elevations, recorded in 2000, range from -6.0 feet to 4.3 feet (depth of over 12 feet).

Table 3 summarizes groundwater level observations made during drilling at BCI's boring locations.

TABLE 3

Groundwater In Borings Summary				
Boring No.	**Approximate Station***	**Approximate Boring Elevation (ft)**	**Depth to Water (ft)**	**Approximate Water Elevation (ft)**
B1	19+50	18.0	18.0	0.0
B2	23+13	18.0	>16.5	<1.5
B4	37+50	16.0	>16.5	<-0.5
B5	39+96	17.0	17.0	0.0
B6	56+72 (430 feet south)	12.0	16.0	-4.0
B7	69+24 (300 feet south)	8.0	9.0	-1.0
B8	70+06 (315 feet south)	8.0	9.0	-1.0
B9	77+00 (230 feet south)	6.0	15.0	-9.0
B10	91+06	7.5	12.0	-4.5
B11	99+74	8.5	>11.5	<-3.0
B12	116+42	9.5	9.0	0.5
B13	126+98	12.0	>11.5	<0.5

Groundwater In Borings Summary				
Boring No.	**Approximate Station***	**Approximate Boring Elevation (ft)**	**Depth to Water (ft)**	**Approximate Water Elevation (ft)**
B14	135+90	14.5	>11.5	<3.0
B15	145+96	15.0	>11.5	<3.5
B16	157+08	13.0	>21.5	<-8.5
B17	171+90	13.5	15.0	-1.5
B18	188+56	12.5	12.0	0.5
B19	199+70	13.5	>16.5	<-3.0
B20	224+40	13.0	16.0	-3.0
B21	233+42	12.5	15.0	-2.5
B22	248+28	30.0	>11.5	<18.5
B23	265+56	38.0	>16.5	<21.5
B24	277+74	58.0	>11.5	<46.5
B25	292+90	47.0	>16.5	<30.5
B26	303+12	58.0	>11.5	<46.5
B27	313+04	50.0	>16.5	<33.5
B28	334+45	20.0	8.5	11.5
B29	337+89	32.4	>21.5	<10.9
B30	342+82	41.5	>11.5	<30.0
B31	362+10	61.5	>16.5	<45.0
B32	375+50	83.0	>11.5	<71.5
B33	388+98	59.0	>16.5	<42.5
B34	400+98	48.5	>11.5	<37.0
B35	415+76	16.0	10.0	6.0
B36	427+24	8.5	15.0	-6.5
B37	434+54	9.0	>16.5	<-7.5

* Estimated by BCI from preliminary plans provided by CDM (4/20/2011)

BCI installed a groundwater observation wells at boring locations B5, B21, B28, and B36 and made the water level observations listed in Table 4:

TABLE 4

Observation Wells Groundwater Levels						
Boring No.	**Water Depth Below Surface/Elevation (feet)**					
	10/6/10	**11/2/10**	**11/30/10**	**3/23/11**	**4/4/11**	**4/23/11**
B5	---	---	---	3.0/14.0	---	5.0/12.0
B21	---	---	---	2.25/10.25	---	3.0/9.5
B28	14.5 /5.5	8.5 /11.5	8.2 /11.8	2.0/18.0	---	4.3/15.7
B36	---	---	---	---	15.0/-6.5	2.8/5.7

5.5 Existing Pavement Sections

BCI recorded existing pavement structural sections at boring locations drilled in roadway pavement. Table 5 lists observed asphalt (AC) and baserock (AB) thicknesses.

TABLE 5

Measured Pavement Structural Sections at Boring Locations				
Boring No.	**Approximate Project Station ***	**Road Name**	**AC (inches)**	**AB (inches)**
B2	23+13	8th Street	4.0	3.0
B22	248+28	Ramal Road	4.0	4.0
B23	265+56	Ramal Road	4.0	5.0

* Estimated by BCI from preliminary plans provided by CDM (4/20/11)

6 LIMITATIONS

BCI performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Where referenced, ASTM and California Test Method standards are used as general (not strict) guidelines only. Do not use or rely upon this report for different locations or improvements without the written consent of BCI. Geotechnical services do not have a warranty.

BCI based this report on the current site conditions and assume the soil and groundwater conditions encountered in explorations are representative of the subsurface conditions throughout the site. Conditions at locations other than the exploration locations could be different.

Logs of explorations are presented in Appendix C. The lines designating the interface between soil types are approximate. The transition between material types may be abrupt or gradual and will vary laterally.

Groundwater elevations discussed in this report represent the groundwater elevation during the time of subsurface exploration and at the exploration locations, or as otherwise indicated. The groundwater table may be lower or higher in the future and at other locations.

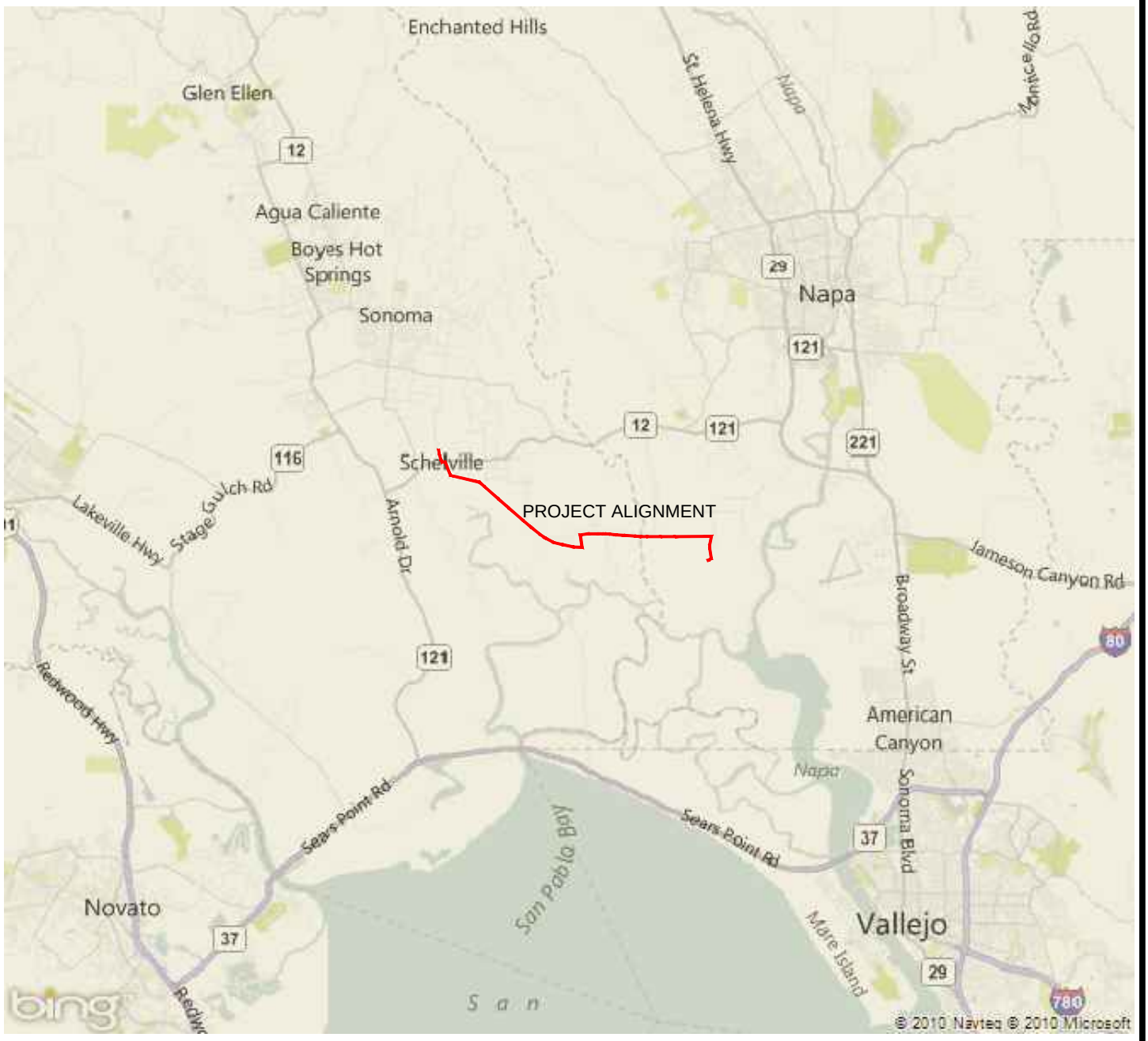
FIGURES

Figure 1: Vicinity Map

Figure 2: Site Map

Figure 3: Geologic Map

Figure 4: Regional Fault Map



N

NO SCALE

4/20/2011 2049.1 Figure 1 Vicinity Map.dwg

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Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

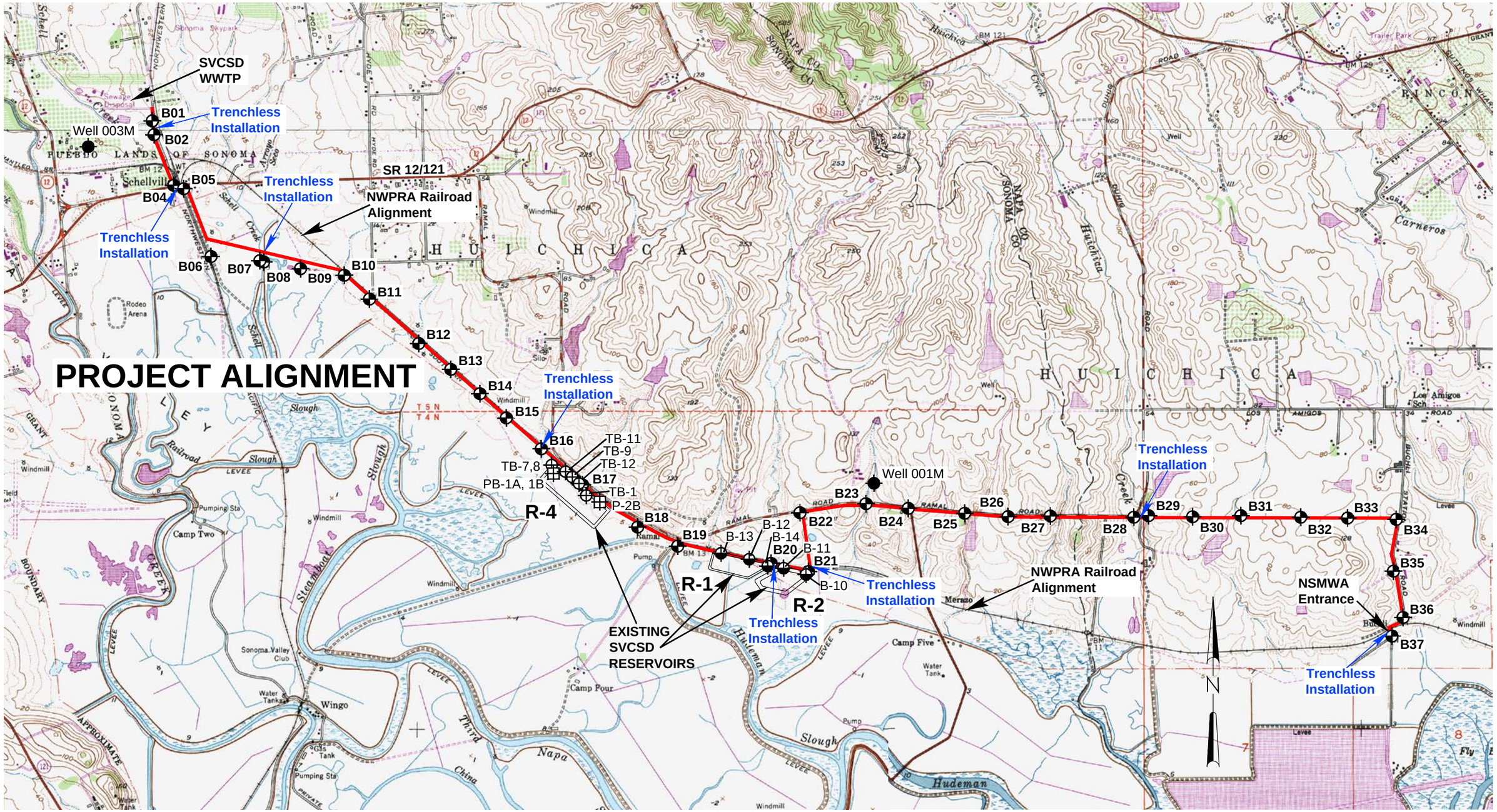
VICINITY MAP

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Figure 1



LEGEND

- B01 - Approximate Boring Location
- Well 003M - Approximate Well Location (DWR Record-see report text)
- TB-1 - Approximate Taber Boring Location (Drilled 2000-see Appendix A)
- PB-2 - Approximate Taber Piezometer Location (Drilled 2000-see Appendix A)
- B-10 - Approximate Taber Boring Location (Drilled 1999-see Appendix A)

Source: MAPTECH Terrain Navigator Pro, v. 7.01, USGS topographic maps, 7.5 minute quadrangle, 1:24000, Sonoma and Napa, dated 1951, photorevised 1980 and Sears Point dated 1951, photorevised 1968, and Cutting Wharf, dated 1949, photorevised 1981.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

SCALE: 1"=2400'

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SITE MAP

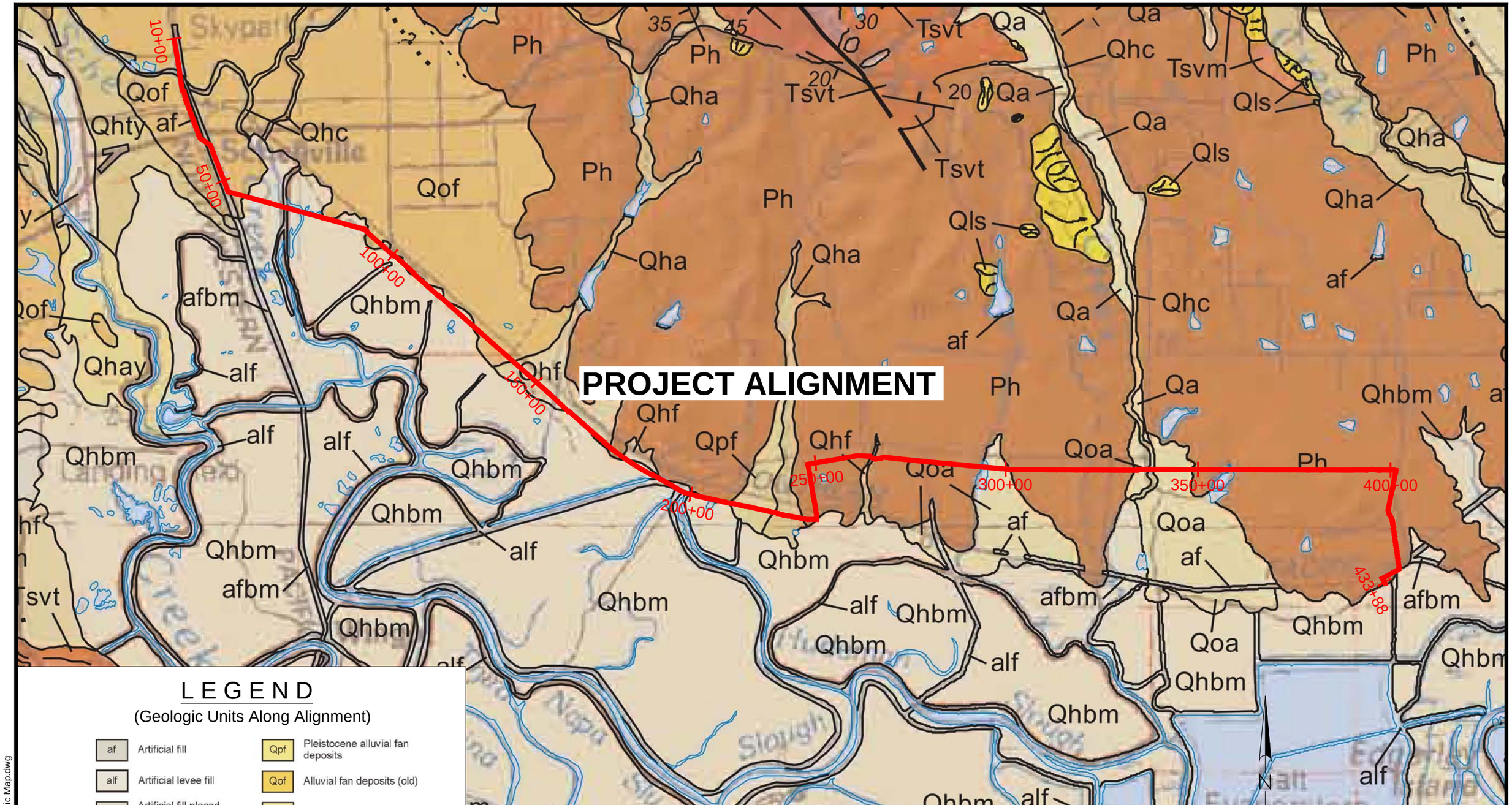
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Figure 2

4/28/2011 2049.1 Figure 2 Site Map.dwg



LEGEND

(Geologic Units Along Alignment)

af	Artificial fill	Qpf	Pleistocene alluvial fan deposits
alf	Artificial levee fill	Qof	Alluvial fan deposits (old)
afbm	Artificial fill placed over bay mud	Qoa	Alluvial deposits (old)
Qhc	Latest Holocene stream channel deposits	Qha	Holocene alluvium
Qhbm	Holocene estuarine deposits (bay mud)	Ph	Huichica Formation
Qhf	Holocene alluvial fan deposits		

Source: Preliminary Geologic Map of the Napa 30' x 60' Quadrangle, California. Compiled by David L. Wagner and Carlos I. Gutierrez, 2010, scale 1:100,000.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

SCALE: 1"=2400'

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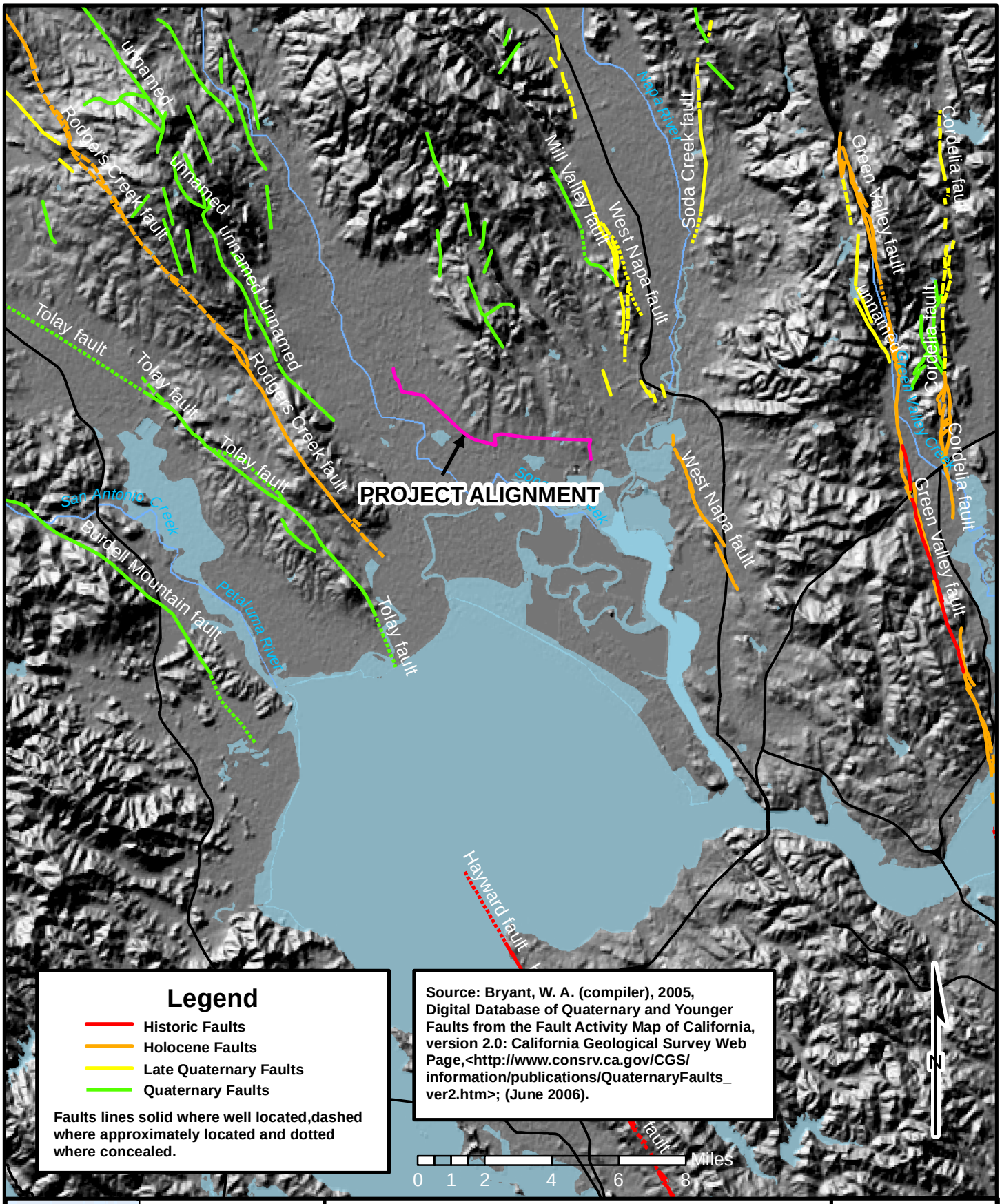
GEOLOGIC MAP

Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Figure 3



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REGIONAL FAULT MAP

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Figure 4

APPENDIX A

Existing Report Boring Logs

-Taber, 2000, Sonoma Valley CSD Reclamation Ponds R1 & R2

(Title Pages, Logs B-10 to B-14, and Location Map)

- Taber, 2000, Sonoma Valley CSD Effluent Reservoir R-4

(Title Pages, Logs P-1A/B, P-2B, B-1, B-7 to B-9, B-11, B-12, and Location Map)

SVCSD Reclam
TW97/98-89

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January 24, 2000

Sonoma Valley County Sanitation District
P.O. Box 11628
Santa Rosa, California 95406-1628

Attention: Kevin Berger

Subject: Geotechnical Evaluation 1P2/598/159
Sonoma Valley CSD Reclamation Ponds R1 & R2
Sonoma County, California

Transmitted herewith is our report of geotechnical study performed at the above site. This report summarizes all data developed for the R1 and R2 reservoirs, including data presented to date and data from "emergency" repairs in progress at R1, along with geotechnical analyses and conclusions for both reservoirs.

If you have any questions concerning this report or subsurface materials/ conditions at the site, please call. We appreciate this opportunity to be of service.

Very truly yours,
TABER CONSULTANTS

Thomas M. Skaug
CEG 1996

TMS/ns

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GEOTECHNICAL EVALUATION
Sonoma Valley CSD Reclamation Ponds R1 And R2
Sonoma County, CA

Prepared for
Sonoma Valley County Sanitation District

1P1/598/159
38122-B4:N346:W046

January 2000

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LIST OF ATTACHMENTS

	"General Conditions"
	"Selected References"
Figure-1	"Test Boring Logs" (24 pages)
	"Boring Legend"
Figure-2	"Gradation Curves" (21 pages)
Figure-3	"Surcharge Volume Change and Direct Shear Tests" (2 pages)
Figure-4	"Consolidation Test"
Figure-5	"Vane Shear Tests"
Plate-1	"Location of Field Tests"

List of Appendices (Bound Separately)

Appendix-A	"Data Transmittal/Proposed Sampling Memorandum, Sonoma Valley CSD Reclamation Pond R-1", dated December 9, 1998
Appendix-B	"Data Transmittal/Proposed Sampling Memorandum, Sonoma Valley CSD Reclamation West Pond (R-1)", dated December 23, 1998
Appendix-C	Test Boring Logs, Taber Consultants, from "Geotechnical Investigation, Wastewater Effluent Storage and Pumping Facilities, Sonoma Valley County Sanitation District", dated November 26, 1986
Appendix-D	Test Boring Logs, Roger Foot Associates, from "Geotechnical Investigation and Remedial Options, Sonoma Valley Wastewater Retention Reservoirs", dated March 23, 1993
Appendix-E	Triaxial Shear Test Reports, Sierra Testing Laboratories, Inc.
Appendix-F	Liquefaction Analysis Summary (LIQUEFY2, Version 1.30)
Appendix-G	Groundwater Elevation Monitoring
Appendix-H	Slope Stability Analysis Summaries (PCSTABL5M)
Appendix-I	"Low Seepage Zone – Laboratory Test Results" dated August 2, 1999.
Appendix-J	Soil-Bentonite Backfill Testing Protocol

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TEST BORING LOG

1P1/598/159

TYPE: 4" Solid Auger to 20.5' then NX Rotary ELEVATION: Existing Ground Surface BORING No 10

UNCONFINED COMPRESS STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH IN FEET	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
									CL	(Stiff) light brown very fine-coarse SANDY fine GRAVELLY CLAY to CLAY with fine SAND (fill)
							5		CL	(Hard and very stiff) very fine-coarse SANDY fine GRAVELLY CLAY to CLAY with SAND (fill)
							10		CL	(Stiff-soft) dark brown and gray CLAY with SAND
	V						15		CL	
	V								CL	(Very stiff-stiff) light brown SILTY CLAY to CLAY
	V						20			
							25		GC	(Dense) brown CLAYEY very fine-coarse SANDY fine GRAVEL with coarse GRAVEL
2.2		98	25	10	1.4	1	30		CL	Soft/loose brown very fine-medium SANDY CLAY/ CLAYEY SAND with trace fine GRAVEL
				23	1.4	2			GP / GC	Compact brown CLAYEY fine GRAVELLY very fine-coarse SAND to CLAYEY SANDY GRAVEL
0.8		91	31	10	1.4	3	35		SC	Loose brown CLAYEY very fine-coarse SAND with fine GRAVEL
							40			No free groundwater encountered while augering. Boring grout backfilled 1-13-99.

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: T.A.K. DATE: 1-13-99

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TEST BORING LOG

1P1/598/159

TYPE: 4-Inch Solid Stem Auger

ELEVATION: Existing Ground Surface

BORING No 11

DEPTH IN FEET	MATERIAL SYMBOL	UNIFIED SOIL CLASS	DESCRIPTION
			(Stiff-very stiff) brown SANDY GRAVELLY CLAY to SILTY CLAY (fill)
5		CL	
10			
			(Soft) dark brown CLAYEY SILT
		ML	
15			
			No free groundwater encountered. Boring grout backfilled 1-14-99.
20			
25			
30			
35			
40			

UNCONFINED COMPRESS. STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.
	V					

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: T.A.K.

DATE: 1-14-99

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TEST BORING LOG

1P1/598/159

TYPE: 4" Solid Auger to 20.0' then NX Rotary ELEVATION: Existing Ground Surface BORING No 12

UNCONFINED COMPRESS STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH IN FEET	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
									CL	Stiff brown very fine-coarse SANDY and GRAVELLY SILTY CLAY (fill)
3.3		111	16	19	1.4	1	5			
							10			
2.8		112	17	19	1.4	2			ML	Semicompact dark gray very fine-fine SANDY SILT
									CL	(Stiff) dark gray SANDY fine GRAVELLY CLAY
	G,A	108	15	24	2.5	3				
	G	113	10	20	1.4	4	15	1-14-99	GP / GM	(Campact)-semicompact brown and gray SILTY and CLAYEY SANDY fine GRAVEL
										Very dense-dense brown CLAYEY very fine-coarse SANDY fine GRAVEL
		130	7	71	1.4	5	20		GC	
		118	12	80	1.4	6	25			
		116	20	42	1.4	7				
		120	14	15	1.4	8	30		ML	Stiff brown fine SANDY CLAYEY SILT with GRAVEL
				38	1.4	9			GC	Dense brown CLAYEY very fine-coarse SANDY fine GRAVEL
							35			Boring grout backfilled 1-14-99
							40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

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TEST BORING LOG

1P1/598/159

TYPE: 4" Solid Auger to 6.5ft. then NX Rotary ELEVATION: Existing Ground Surface BORING No 13

UNCONFINED COMPRESS. STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH IN FEET	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
4.2		118	14	23	1.4	1	5		CL	Very stiff brown SANDY fine GRAVELLY CLAY (fill)
									ML	(Stiff) dark gray fine SANDY CLAYEY SILT
		118	12	19	1.4	2	10		GC	Semicompact brown CLAYEY and SILTY SANDY fine GRAVEL
1.1		107	21	21	1.4	3	15		CL	Very stiff brown fine SANDY SILTY CLAY
		110	18	26	1.4	4	20		GP / GC	Compact brown SANDY CLAYEY fine GRAVEL
2.1		111	19	28	1.4	5	25			
				35	1.4	6	30			
							35			No free groundwater encountered. Boring grout backfilled 1-15-99.
							40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: T.A.K. DATE: 1-14-99

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TEST BORING LOG

1P1/598/159

TYPE: 4-Inch Solid Stem Auger

ELEVATION: Existing Ground Surface

BORING No 14

UNCONFIN COMPRES STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH IN FEET	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
3.6		117	14	25	1.4	1	5		CL	Very stiff to stiff brown very fine-coarse SANDY CLAY with fine GRAVEL (fill)
1.2		113	15	12	1.4	2	10			
	V	113	18	19	2.5	3	15		CL	Stiff gray and brown fine SANDY SILTY CLAY
0.7		115	11	58	1.4	4	20		GC	Dense brown CLAYEY very fine-coarse SANDY fine GRAVEL (1-19-99)
1.8		102	24	14	1.4	5	25		CL	Stiff light brown fine SANDY CLAY
							30			No free groundwater encountered. Boring grout backfilled 1-19-99.
							35			
							40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

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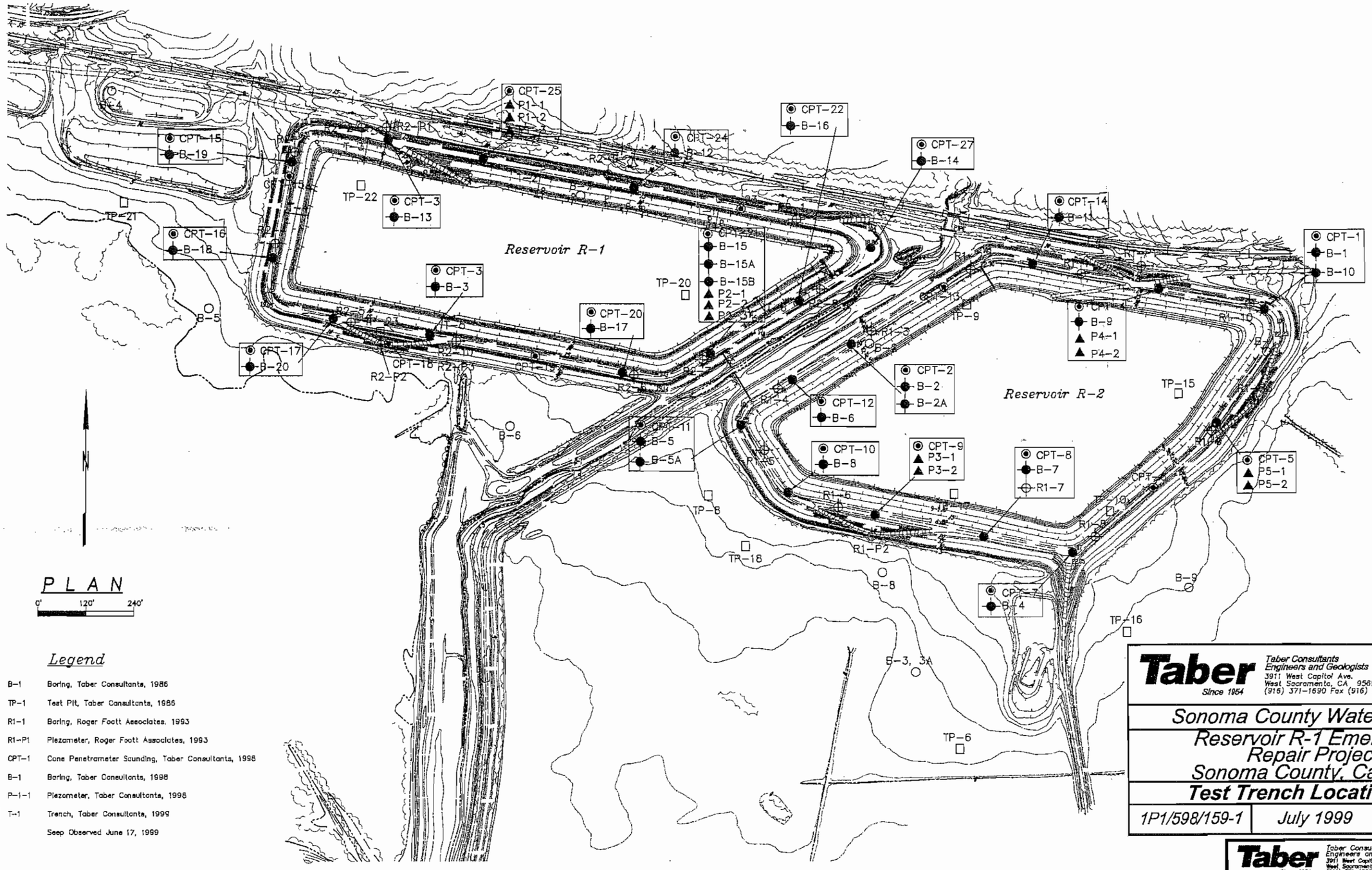

Legend

○	B-1	Boring, Taber Consultants, 1986
□	TP-1	Test Pit, Taber Consultants, 1986
⊕	R1-1	Boring, Roger Foott Associates, 1993
⊕	R1-P1	Piezometer, Roger Foott Associates, 1993
◉	CPT-1	Cone Penetrometer Sounding, Taber Consultants, 1998
●	B-1	Boring, Taber Consultants, 1998
▲	P-1-1	Piezometer, Taber Consultants, 1998
⊢⊣	T-1	Trench, Taber Consultants, 1999
		Seep Observed June 17, 1999

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Sonoma County Water Agency

Reservoir R-1 Emergency Repair Project
Sonoma County, California

Test Trench Location Map

1P1/598/159-1	July 1999	Figure - 2

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Sonoma County Water Agency

Reservoirs R-1 & R-2
Sonoma County, California

Location of Field Tests

1P1/598/159	July 1999	Plate - 1

7.13.99 1P1598159Location.dwg 1=1

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June 28, 2000

Ms. Liz Ellis, P.E.
Green Valley Consulting Engineers
1400 N. Dutton Avenue, Suite 17
Santa Rosa, California 95401

Subject: Geotechnical Investigation 70-12-7#26 — 1P2/599/96-3
Sonoma Valley CSD Effluent Reservoir R-4 — 38122-B4; 366N 080W
Sonoma County, California

Dear Ms. Ellis:

Attached hereto is our report of geotechnical investigation performed at the above site. One copy is being sent to John Hanson, design engineer for this project. Much of the data included herein has been previously forwarded to Mr. Hanson to expedite the design process.

If you have any questions concerning this report or subsurface materials/ conditions at the site, please call. We appreciate this opportunity to be of service.

Very truly yours,
TABER CONSULTANTS

Thomas M. Skaug
Senior Geologist

TMS/ns

Distribution: Addressee (7)
John Hanson (1)

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GEOTECHNICAL INVESTIGATION
Sonoma Valley CSD Effluent Reservoir R-4
Sonoma County, California

70-12-7 #26

Sonoma Valley CSD
Owner

1P2/599/96-3
38122-B4 N366:W082

June 2000

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TABLE OF CONTENTS

Page

INTRODUCTION 1

SITE DESCRIPTION 1

PROJECT DESCRIPTION 2

BACKGROUND 3

STUDY PROCEDURES 3

GEOLOGIC SETTING/SEISMICITY 6

EARTH MATERIALS 7
- Fill 7
- Topsoil 8
- Alluvium 8
- Young Alluvium 8
- Older Alluvium 9

GROUNDWATER 11

LIQUEFACTION ANALYSES 13

CONCLUSIONS 15
- Grading/Embankment Foundation 15
- Cutoff Trench 16
- Groundwater Control 16
- Materials Placement 17
- Shrinkage/Bulking/Moisture 18
- Finish Slopes 19
- Settlement 19
- Erosion 20
- Soil Corrosivity 20

PLAN REVIEW AND CONSTRUCTION OBSERVATION 20

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LIST OF ATTACHMENTS

"General Conditions"
"Selected References"

Figure-1	Test Boring Logs (24 pages)
	"Boring Legend"
Figure-2	Laboratory Test Results (16 pages)
Figure-3	Location of Field Tests
Figure-4	Cross Section A – A′
Figure-5	Cross Section B – B′
Figure-6	Cross Section C – C′
Figure-7	Cross Section D – D′
Figure-8	Cross Section E – E′
Figure-9	Cross Section F – F′
Figure-10	Cross Section G – G′
Figure-11	Cross Section H – H′
Figure-12	Cross Section I – I′
Figure-13	Typical Section – Ground Preparation
Figure-14	Test Pit Logs
Figure-15	D698 Compaction Curves

LIST OF APPENDICES (Bound Separately)

Appendix A	"CPT/SPT Site Specific Correlation & Calibration Program"
Appendix B	"Data Transmittal / Proposed Sampling Memorandum"
Appendix C	"Preliminary Estimate of Construction Dewatering Requirements"
	"Hydrogeologic Assessment of the Ramal Road Reservoir Site"
	"R-4 Dewatering Calculations"
Appendix D	Triaxial Shear Test Reports (Sierra Testing Laboratory)
Appendix E	Log of Boring B-11, Taber Consultants, 1986
Appendix F	BACE Geotechnical: Logs of Borings 1 through 12 and Test Pits TP-1 through TP-7
	Soil Classification Chart and Key to Test Data
	Physical Properties Criteria For Soil Classification
	Typical Piezometer Well Completion Detail
Appendix G	BACE Geotechnical Laboratory Results
Appendix H	CPT Logs
Appendix I	Liquefaction Calculation Printouts

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TEST BORING LOG

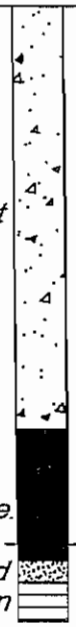
Job No. 1P2/599/96-3

TYPE: 4-inch Auger

ELEVATION: 6.6

BORING No. P-1A

% <200	UNCONFIN COMPRESS. STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
										CL	Stiff brown with gray CLAY with SILT and fine SAND
								5			
											12/30/99
								10			
								15		SM	(Loose) brown SILTY fine to coarse SAND with trace fine to coarse GRAVEL
					3/2/7/25	2.0	1				
								20		CL	Hard light brown CLAY with SILT and fine GRAVELLY fine to coarse SANDY CLAY layers
					10/20/32/45	2.0	2				
								25			Piezometer installed to 16.0ft. depth. with 1.1ft. stickup. Screened interval between 16.0ft and 17.0ft. depth.
								30			
								35			
								40			



THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 12-30-99

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Taber Consultants
Engineers and Geologists
3911 West Capitol Avenue
West Sacramento, CA 95691-2116

TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 6-inch Hollow Stem Auger

ELEVATION: 5.8

BORING No. P-1B

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	Description
								5, 10		CL	Stiff brown with gray CLAY with SILT and fine SAND
								15		SM	Loose brown SILTY fine to coarse SAND with trace fine to coarse GRAVEL
					17/20/27	2.0	1	20		CL	Hard light brown CLAY with SILT and trace fine-coarse SAND
					6/9/15/20	2.0	2	25		SC	Compact light brown with gray mottling SILTY CLAYEY fine to coarse SAND with trace fine to coarse GRAVEL
					34/35/24	2.0	3			SC	Dense brown SILTY fine GRAVELLY CLAYEY fine to coarse SAND
								30, 35, 40			

▼ 12/30/99

Grout

Bentonite

Sand

Screen

Piezometer installed to 27.5ft. depth. with 0.8ft. stickup. Screen interval between 26.3 and 27.5ft. depth.

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 12-30-99

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger

ELEVATION: 14.2

BORING No. P-2B

% <200	UNCONFINED COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.
	4.8		112	18	4/8/10	1.4	1
	5.2		111	20	7/9/12	1.4	2
	0.8		90	20	11/13/22	1.4	3
17	0.9	G	103	15	16/25/32	1.4	4
	8.5		114	17	11/14/19	1.4	5
			105	13	10/14/16	1.4	6
29	0.3	G	102	11	16/84-0.9	1.4	7
26		G	95	13	9/17/21	1.4	8
37	1.5	G	113	17	7/7/6	1.4	9
	2.7		109	20	5/5/8	1.4	10

DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	Description
		CL	(Stiff) dark brown fine SANDY SILTY CLAY with trace fine GRAVEL (fill)
5		CL	Stiff dark to light brown fine SANDY SILTY CLAY
10			Grout
		CL	(Stiff) light brown CLAY with SILT and trace fine SAND
			1/4/00
15		CL	Very stiff brown fine-coarse SANDY CLAY with SILT and fine GRAVEL and white to buff GRAVELLY SAND layers
20		SM	Dense light brown to white and dark brown SILTY fine GRAVELLY fine-coarse SAND with trace CLAY
25		CL	Very stiff orange brown SILTY fine-medium SANDY CLAY with trace fine GRAVEL
		CL	Very stiff orange brown fine GRAVELLY CLAY with fine to coarse SAND and SILT
30		SC	Very dense and dense light brown to brown fine GRAVELLY CLAYEY fine to coarse SAND with SILT and SILTY fine SAND layers
			1/4/00
35		SC	Semicompact orange brown fine GRAVELLY CLAYEY fine-coarse SAND with SILT and SILTY fine SAND layers
		CL	Stiff brown SILTY fine SANDY CLAY
40			Bentonite

--CONTINUED--

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-4-00

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TEST BORING LOG

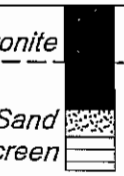
Job No. 1P2/599/96-3

TYPE: 4-inch Auger

ELEVATION: 14.2

BORING No. P-2B cont.

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	Description
	3.6		116	17	7/10/12	1.4	11			CL	Stiff brown SILTY fine SANDY CLAY
49		G	106	18	16/17/15	1.4	12			GC / CL	Dense orange brown fine to coarse SANDY CLAYEY GRAVEL to GRAVELLY CLAY
	2.0		94	30	5/7/8	1.4	13	45		CL	Stiff light brown with black mottling CLAY with SILT and very fine SAND
								50			
								55			
								60			
								65			
								70			
								75			
								80			



Piezometer installed to 44.3ft. depth. with 0.5ft. stickup. Screened interval between 43.3ft. and 44.3ft. depth.

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-4-00

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger to 5.0'/3-inch Rotary ELEVATION: 6.6± (per topo) **BORING No. 1**

% <200	UNCONFIN COMPRESS STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/ft. (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
	4.0	A	108	19	17	1.4	1			CL	Stiff brown CLAY to very fine-coarse SANDY CLAY
	2.6		105	20	21	1.4	2	5			
33	0.9	G	111	19	18	1.4	3			SC	Compact and semicompact brown interbedded CLAYEY and SILTY very fine-coarse GRAVELLY SAND and CLAYEY very fine-fine SAND
16	1.1	G	116	14	22	1.4	4	10			
12	2.1	G	126	11	44	1.4	5			GC	Dense brown CLAYEY very fine-coarse SANDY fine GRAVEL
	0.7		115	15	15	1.4	6	15			
	3.9	A	108	19	19	1.4	7			CL	Stiff brown CLAY
27	1.3	G,A	114	16	51	1.4	8	20		SC / GC	Dense brown CLAYEY very fine-coarse SANDY fine GRAVEL to 23.0ft. groding to brown GRAVELLY CLAYEY SAND
24	2.2	G	107	18	39	1.4	9				
22	2.2	G	110	16	65	1.4	10	25			
	1.5		110	15	38	1.4	11				
	5.9		114	17	27	1.4	12	30		CL	Very stiff-stiff and locally soft SANDY CLAY locally with fine GRAVEL
	2.7	A	106	21	16	1.4	13				
	2.6		103	21	11	1.4	14	35			
30	1.4	G,A	95	28	9	1.4	15				
								40		GC	Compact-semicompact brown CLAYEY very fine-coarse SANDY fine GRAVEL
											-- Boring Continues --

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: T.A.K. DATE: 7-8-99

04/24/00 1P259996-3aa.dwg 1=1

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger to 5.0'/3-inch Rotary ELEVATION: 6.6± (per topo)

BORING No. 1 cont.

% <200	UNCONFIN COMPRESS. STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/ft. (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
					20	1.4	16				Compact-semicompact brown CLAYEY very fine-coarse SANDY fine GRAVEL
16	0.4	G	110	17	18	1.4	17			GC	
	2.0		106	21	10	1.4	18	45		CL	Stiff brown CLAY
	1.6	A	103	23	10	1.4	19				
								50			Boring dry during augering (depth to 5.0ft.) Boring grout backfilled 7-8-99
								55			
								60			
								65			
								70			
								75			
								80			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: T.A.K. DATE: 7-8-99

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger/2.5-inch Rotary

ELEVATION: 8.8

BORING No. 7

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	Description
										SC	(Compact) dark brown SILTY CLAYEY fine-coarse SAND with fine GRAVEL
										SC	(Semicompact) light brown SILTY CLAYEY fine-medium SAND
	6.0		114	17	11/12/15	1.4	1	5		CL	Very stiff light brown fine SANDY SILTY CLAY
					500psi	2.0	2	10			▽ 1/6/00
			122	12	26/33/37	2.5	3	15		SP / SM	Very dense/dense brown to dark gray SILTY fine to coarse GRAVELLY fine to coarse SAND with trace CLAY
	3.9		110	21	7/8/9	1.4	4	20		CL	Stiff light brown fine SANDY SILTY CLAY with SANDY CLAY with fine GRAVELLY layers
	2.0		119	15	1/5/9/8	1.4	5				
								25			Boring grout backfilled 1-6-00.
								30			
								35			
								40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-6-00

03/13/00 1P259996-3m.dwg 1=1

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger/2.5-inch Rotary

ELEVATION: 8.8

BORING No. 8

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
										SC	(Compact) dark brown SILTY CLAYEY fine-coarse SAND with fine GRAVEL
										SC	(Semicompact) light brown SILTY CLAYEY fine-medium SAND
								5		CL	Very stiff light brown fine SANDY SILTY CLAY
		T	90	31	500psi	2.0	1	10			
28	1.0	G	100	25	3/6/8	1.4	2			SC	Semicompact brown SILTY CLAYEY fine-coarse SAND with GRAVEL
14	2.0	G	120	15	8/16/25	1.4	3	15		SP/SC	Dense brown fine to coarse GRAVELLY fine-coarse SAND with CLAY.
10		G	116	17	5/17/20	1.4	4			SW/SC	Dense dark brown fine-coarse SANDY fine to coarse GRAVEL with SILT and CLAY
	3.3		107	22	7/7/8/10	1.4	5	20		CL	Stiff light brown fine SANDY SILTY CLAY
											Boring grout backfilled 1-6-00.
								25			
								30			
								35			
								40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. DATE: 1-6-00

03/13/00 1P259996-3n.dwg 1=1

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 4-inch Auger/6-inch Hollow Stem Auger ELEVATION: 10.8

BORING No. 9

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
										SC	(Compact) light brown SILTY CLAYEY fine GRAVELLY fine-coarse SAND (fill)
										CL	(Stiff) dark brown with black fine GRAVELLY SILTY fine to medium SANDY CLAY
	7.9		113	18	6/9/15	1.4	1	5		CL	Very stiff dark brown fine SANDY SILTY CLAY
	2.3		101	25	4/6/8	1.4	2	10		SC	Semicompact light brown SILTY CLAYEY fine-medium SAND
			92	27	4/4/6	2.5	3			SM	Loose light brown SILTY fine SAND with trace medium SAND
15		G	122	8	20/28/40	1.4	4	15		SM	Dense brown SILTY fine to coarse GRAVELLY fine-coarse SAND with CLAY
	5.2		110	20	5/8/11	1.4	5	20		CL	Stiff light brown with black streaks CLAY with SILT and trace fine SAND
	3.1		97	28	3/4/7/8	1.4	6	25			
					500psi	2.0	7	30			
					2/5/9	1.4	8				
								35			Hole collapsed to 8±ft. depth after pulling auger. Groundwater not measured. Boring grout backfilled 1-6-00.
								40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-6-00

03/13/00 1P259996-3a.dwg 1=1

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 6" Hollow Auger to 4'/2.5-inch Rotary ELEVATION: 11.2

BORING No. 11

% <200	UNCONFIN. COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydroulic Pressure or Blows/6-Inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	
										SC	(Compact) dark brown CLAYEY SILTY fine to coorse SAND with fine GRAVEL
										CL	Very stiff light brown CLAY with SILT
	8.7		113	22	10/14/18	1.4	1	5			
										CL	Soft light brown fine SANDY CLAY with SILT
	0.3		94	29	2/3/3/3	1.4	2	10			
39		H	93	30	2/3/5	1.4	3			SM	Loose dark brown SILTY fine-medium SAND ▼ 1/7/00
								15			
17		G	109	21	6/5/10	1.4	4			SM / SC	Semicompoct brown SILTY CLAYEY fine to medium SAND
23	2.8	G	115	18	7/9/9/11	1.4	5	20		CL	Stiff light brown CLAY with SILT
								25			Boring grout backfilled 1-7-00.
								30			
								35			
								40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-7-00

03/13/00 1P259996-3q.dwg 1=1

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TEST BORING LOG

Job No. 1P2/599/96-3

TYPE: 6-inch Hollow Stem Auger

ELEVATION: 10.8

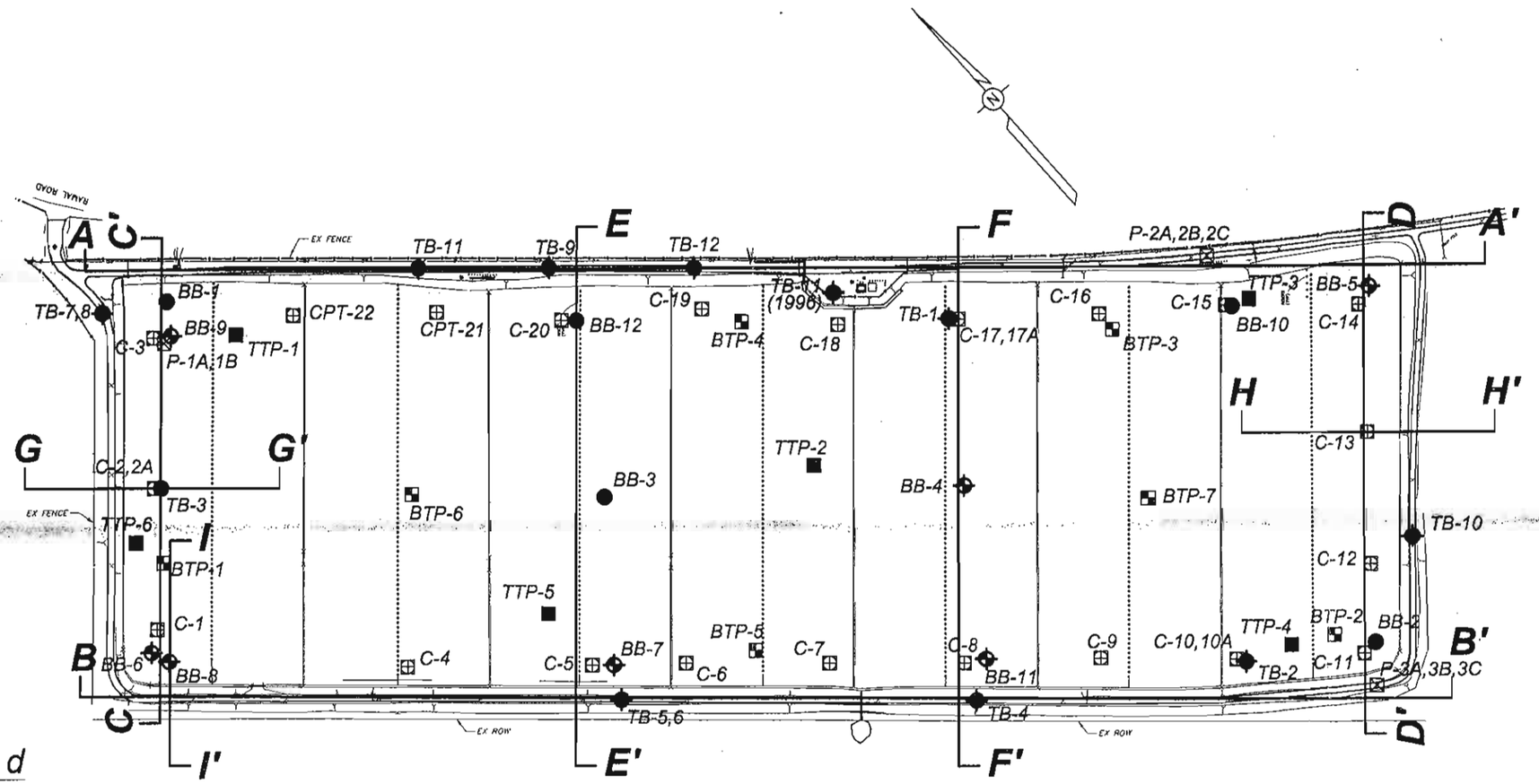
BORING No. 12

% <200	UNCONFINED COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	Max. Hydraulic Pressure or Blows/6-inch (350 ft-lb)	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH (in feet)	MATERIAL SYMBOL	UNIFIED SOIL CLASS	Description
										SC	(Compact) dork brown CLAYEY SILTY fine-coarse SAND with fine GRAVEL
										CL	(Very stiff) light brown CLAY with SILT
								5			
								10			▼ 1/7/00
								15		SC	(Semicompact) brown SILTY CLAYEY fine-coarse SAND with fine GRAVEL
								20			
								25		CL	(Stiff) light brown CLAY with SILT
								30		SC	Semicompact brown SILTY CLAYEY fine-coarse SAND
		T	105	22	5/6/10	2.0	1				
					4/6/7	1.4	2			CL	Stiff light brown CLAY with SILT
								35			Hole collapsed to 10±ft. depth ofter pulling ouger out of hole. Boring grout backfilled 1-7-00.
								40			

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

LOGGED BY: M.W.M. | DATE: 1-7-00

03/13/00 1P259996-3r.dwg 1=1



Legend

- C-3 – Cone penetrometer test
- TB-1 – Taber boring
- P-2 – Taber piezometer
- TTP-2 – Taber test pit
- BB-1 – BACE boring
- BTP-3 – BACE test pit
- BB-3 – BACE boring with piezometer

PLAN

Scale 1" = 200'

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Green Valley Consulting Engineers

Sonoma Valley CSD
Effluent Reservoir R-4

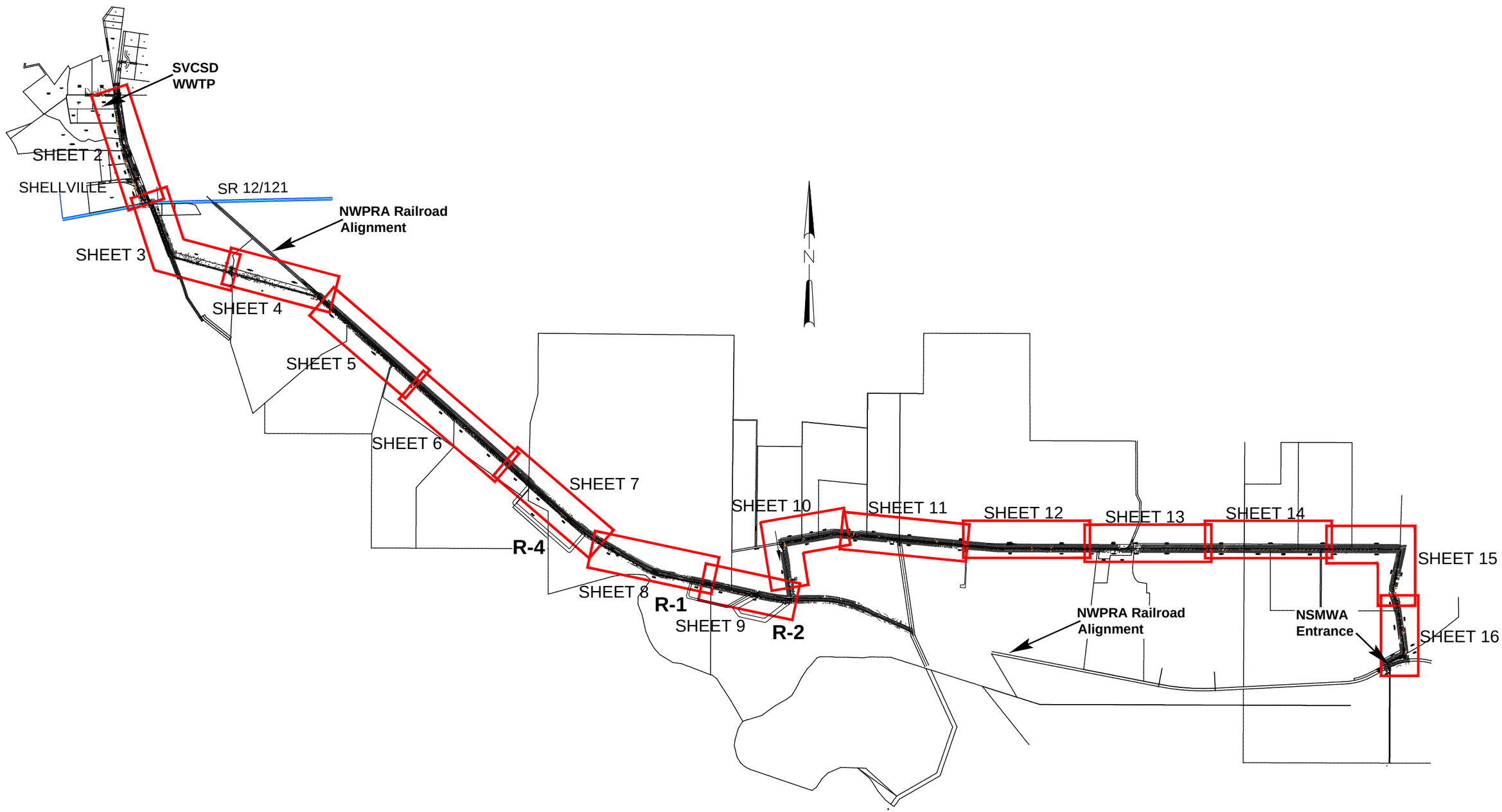
LOCATION OF FIELD TESTS

1P2/599/96-3	April 2000	Figure - 3

06/22/00 1P259996-3y.dwg 1=1

APPENDIX B

Boring Location Map, BCI 2011; Sheets 1 through 16



SCALE: 1"=2400'

blackburn consulting
11521 Blocker Drive, Ste 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

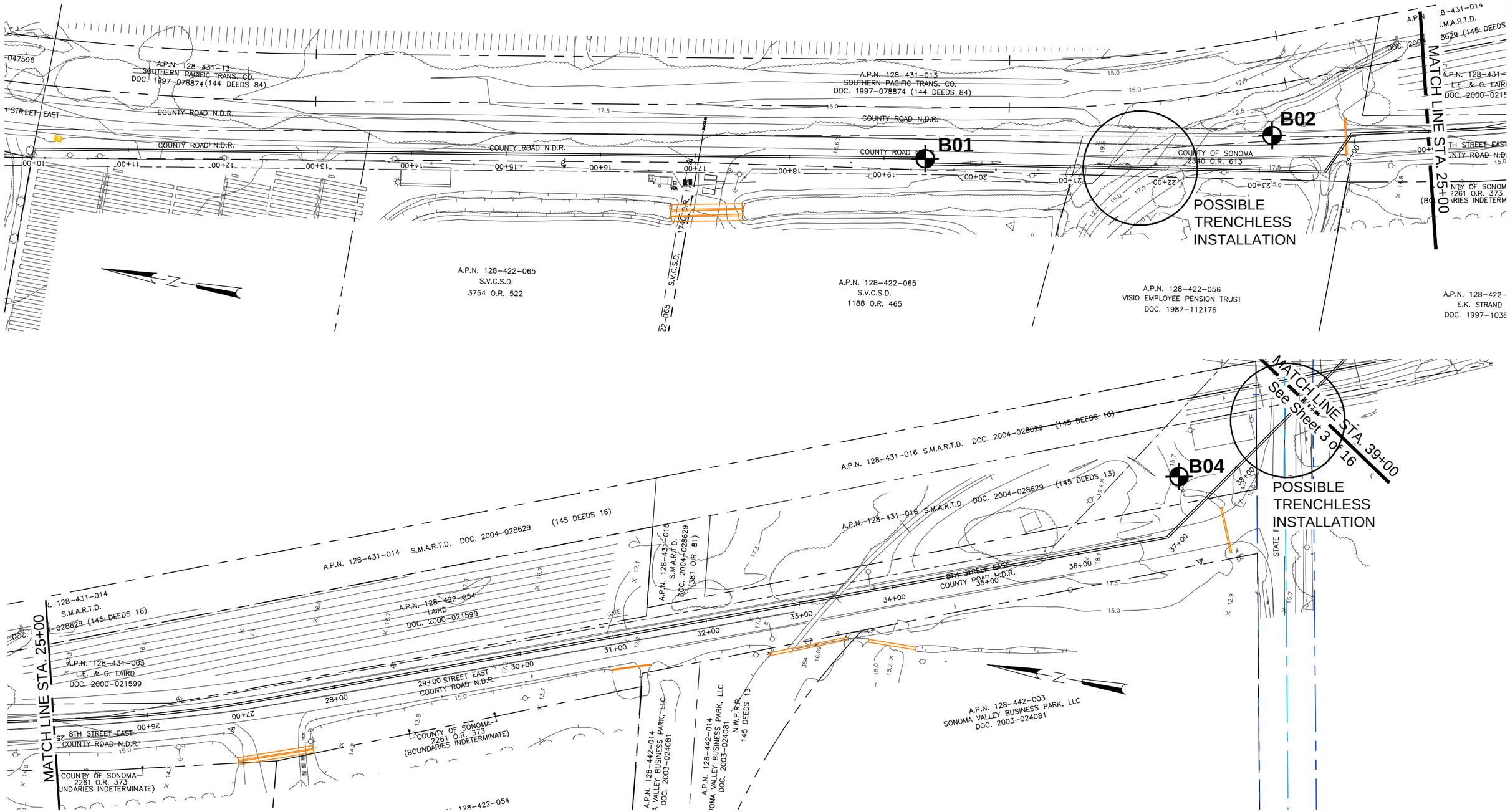
BORING LOCATION MAP INDEX

Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 1 of 16



LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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BORING LOCATION MAP

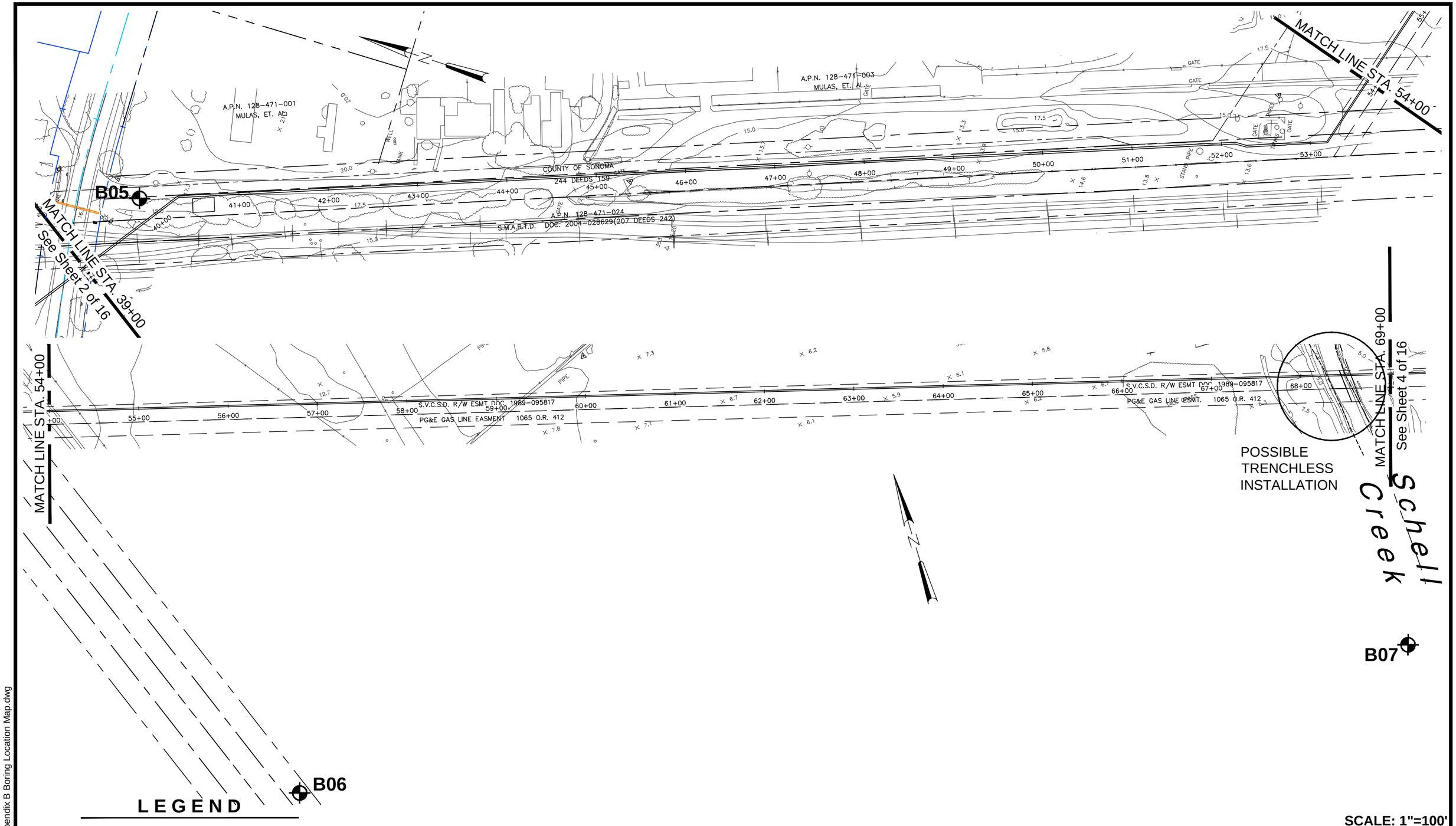
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 2 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg



SCALE: 1"=100'

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BORING LOCATION MAP

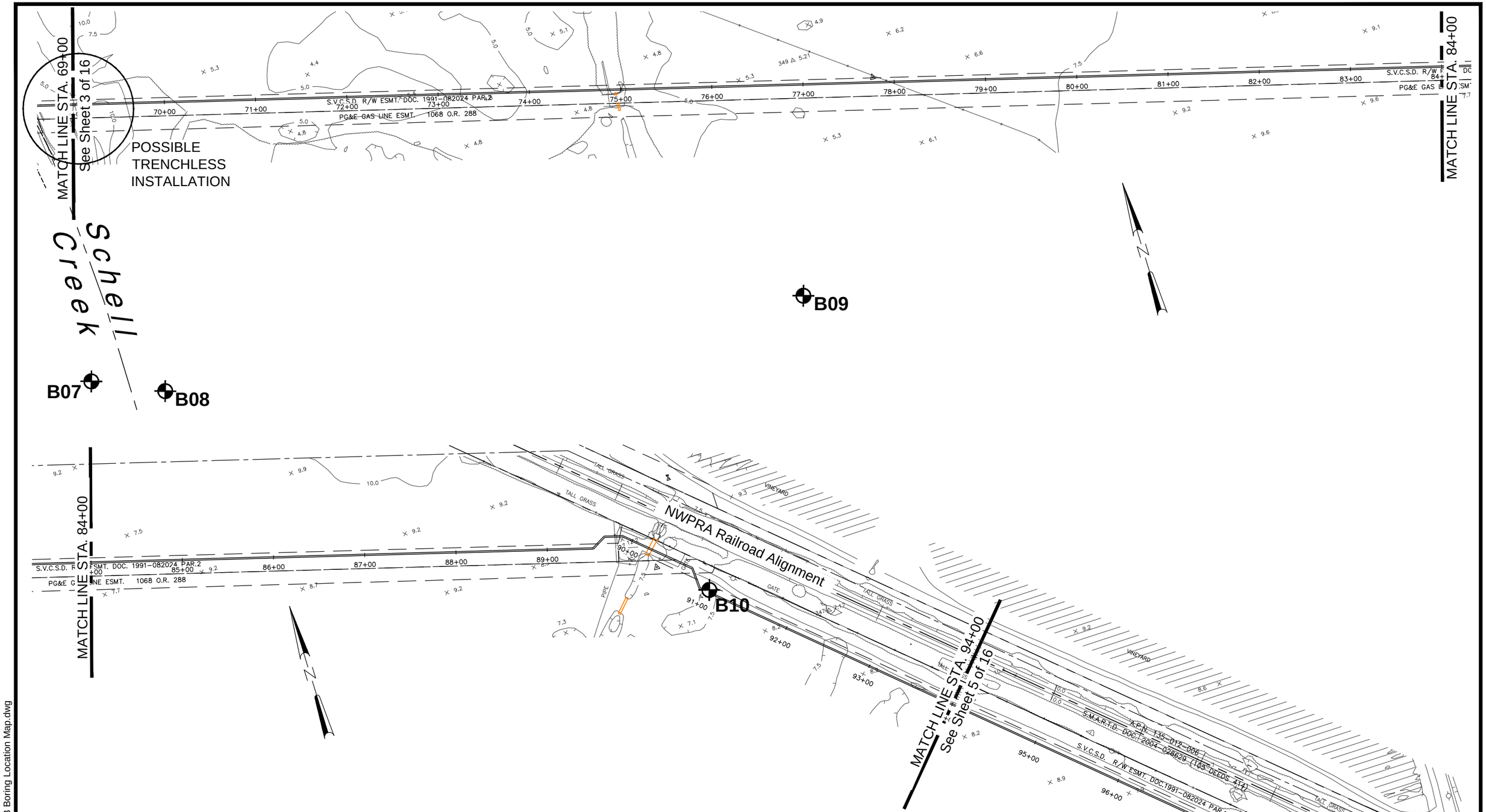
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 3 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg



LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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BORING LOCATION MAP

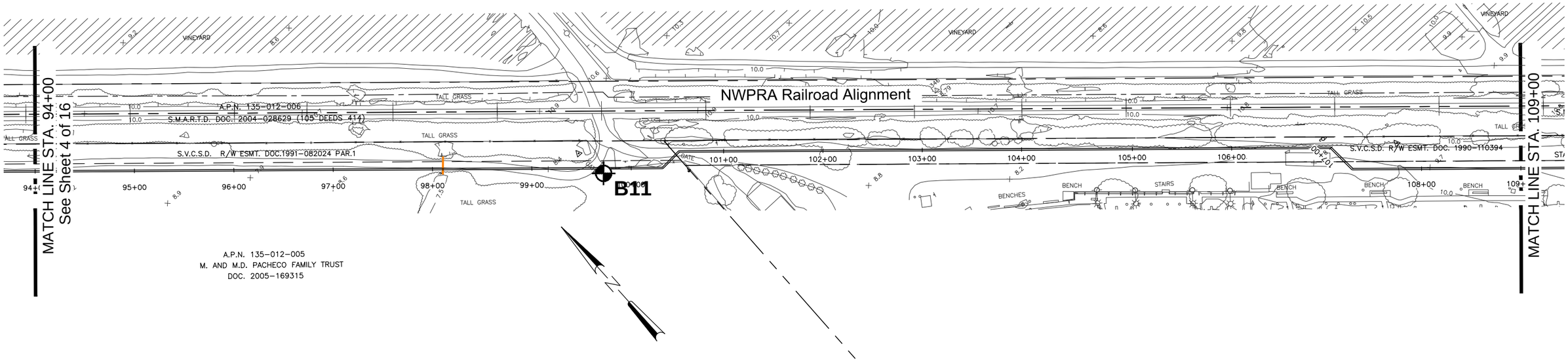
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

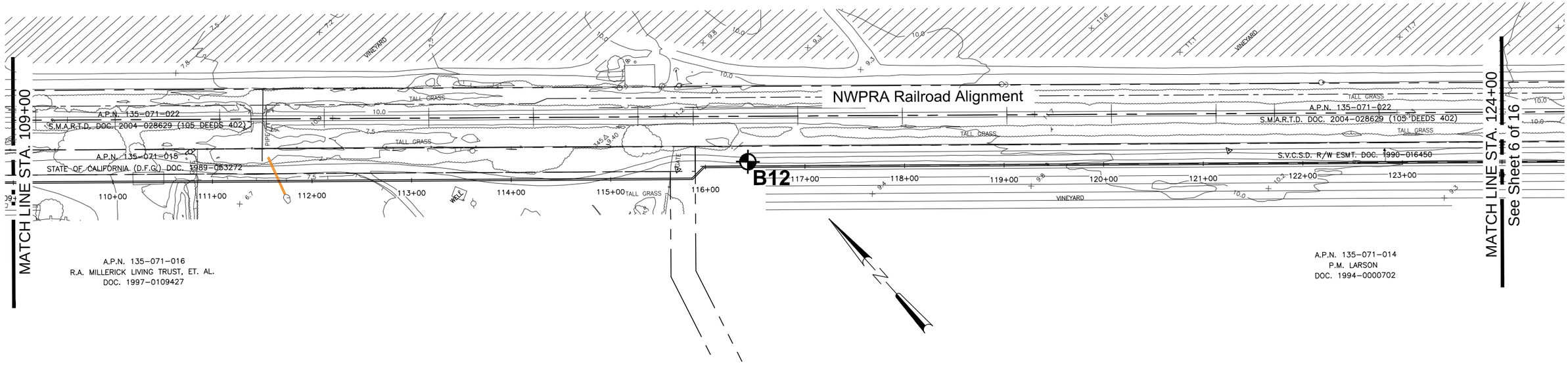
File No. 2049.1

April 2011

Appendix B
Sheet 4 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg





LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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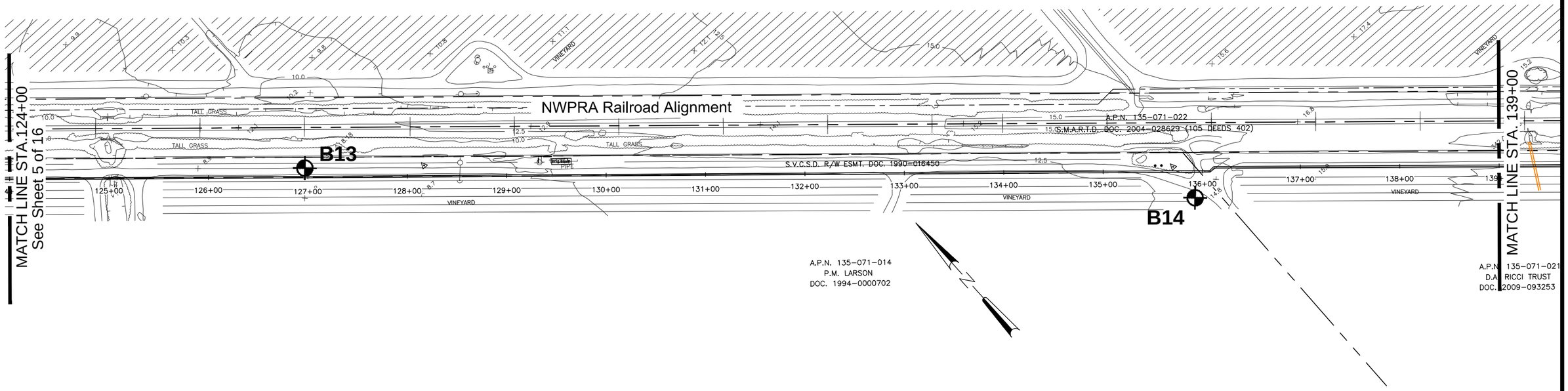
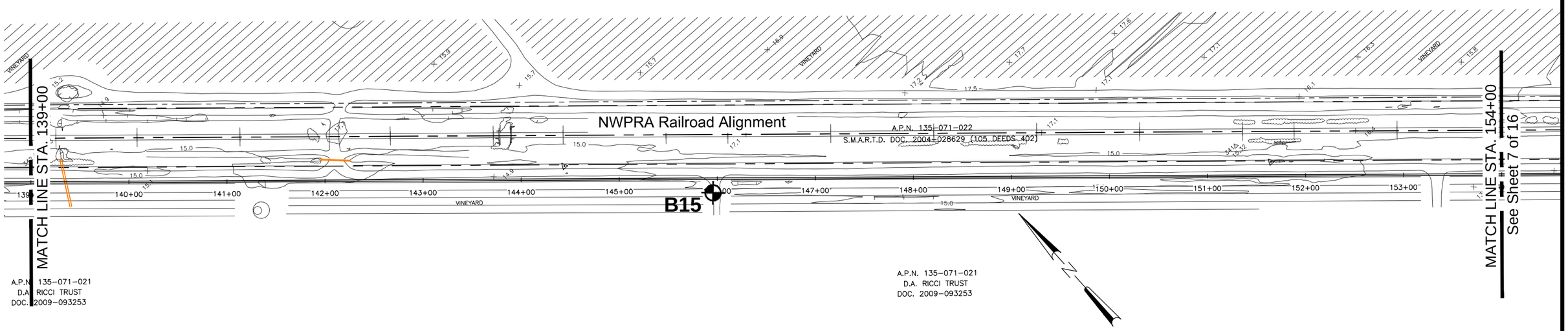
BORING LOCATION MAP

Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1
April 2011
Appendix B
Sheet 5 of 16





LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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BORING LOCATION MAP

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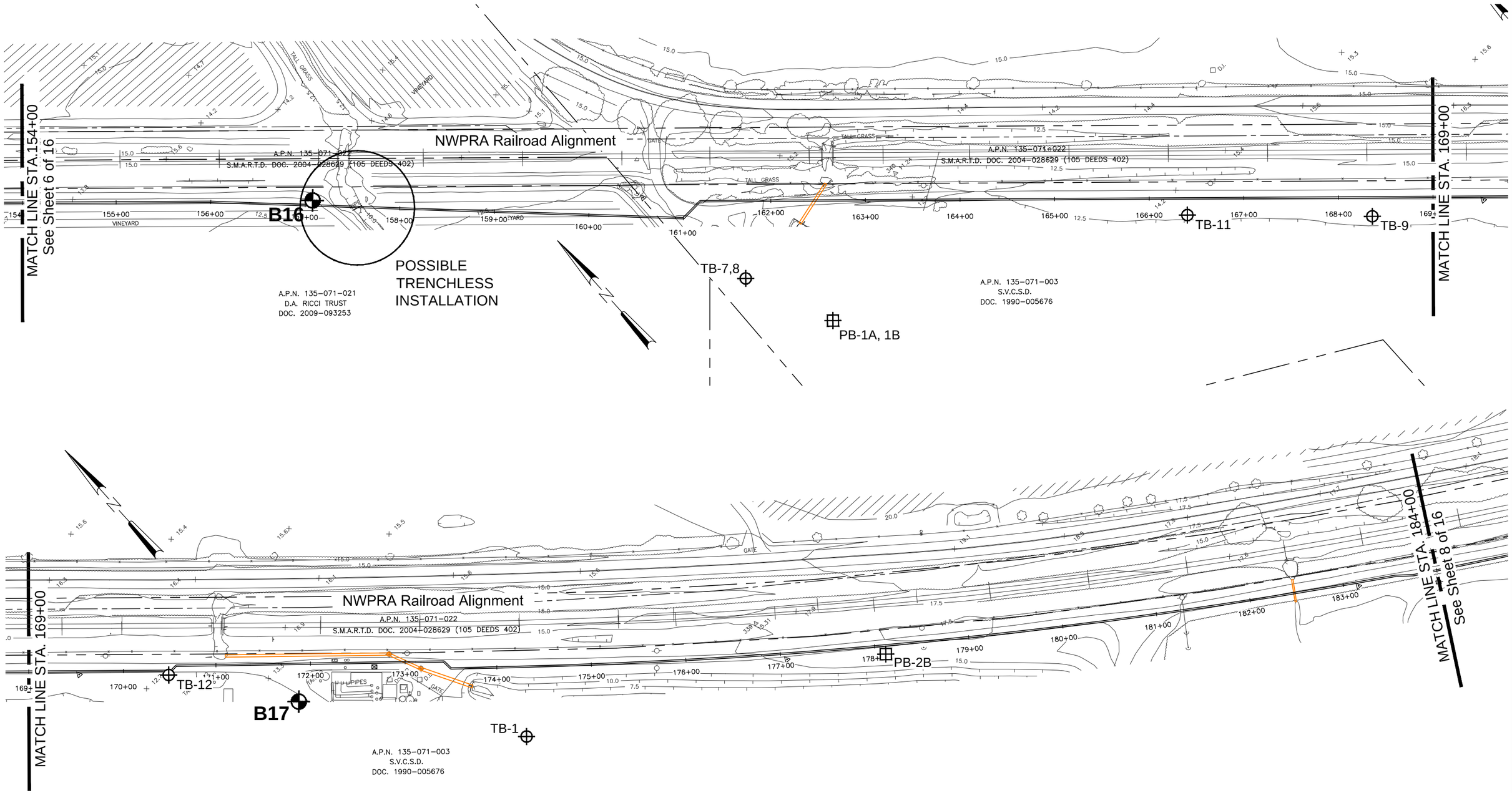
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 6 of 16



LEGEND

B01 Approximate Boring Location

TB-1 - Approximate Taber Boring Location (Drilled 2000-see Appendix A)

PB-2 - Approximate Taber Piezometer Location (Drilled 2000-see Appendix A)

SCALE: 1"=100'

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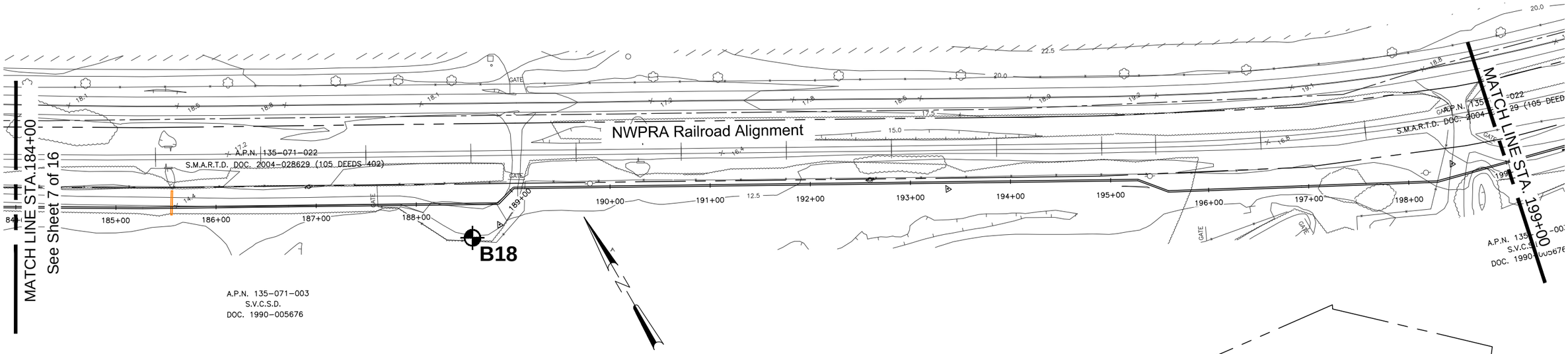
BORING LOCATION MAP

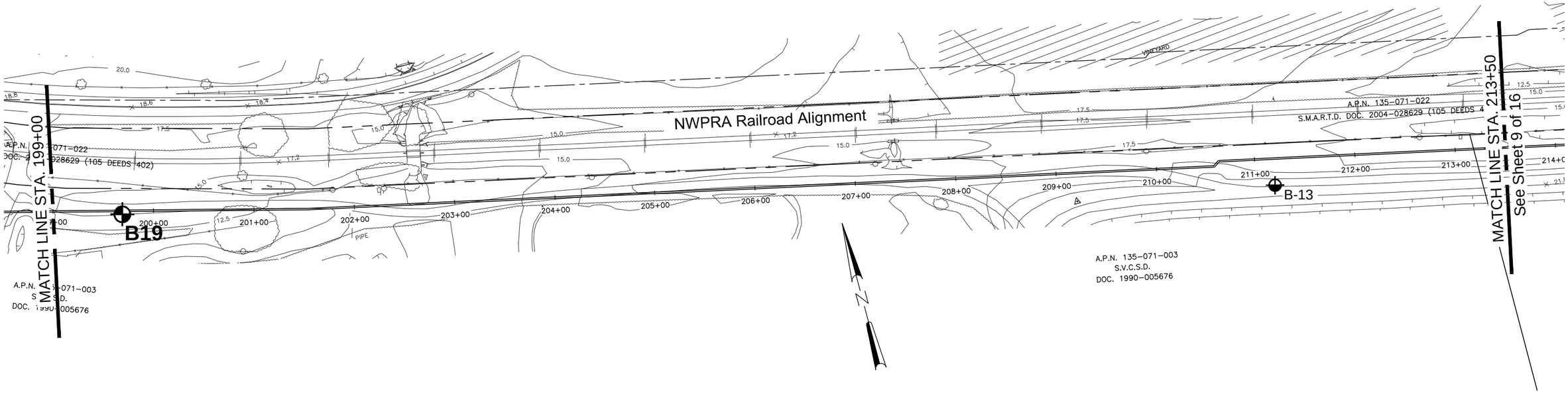
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 7 of 16





LEGEND

B01 Approximate Boring Location

B-10 - Approximate Taber Boring Location (Drilled 1999-see Appendix A)

SCALE: 1"=100'

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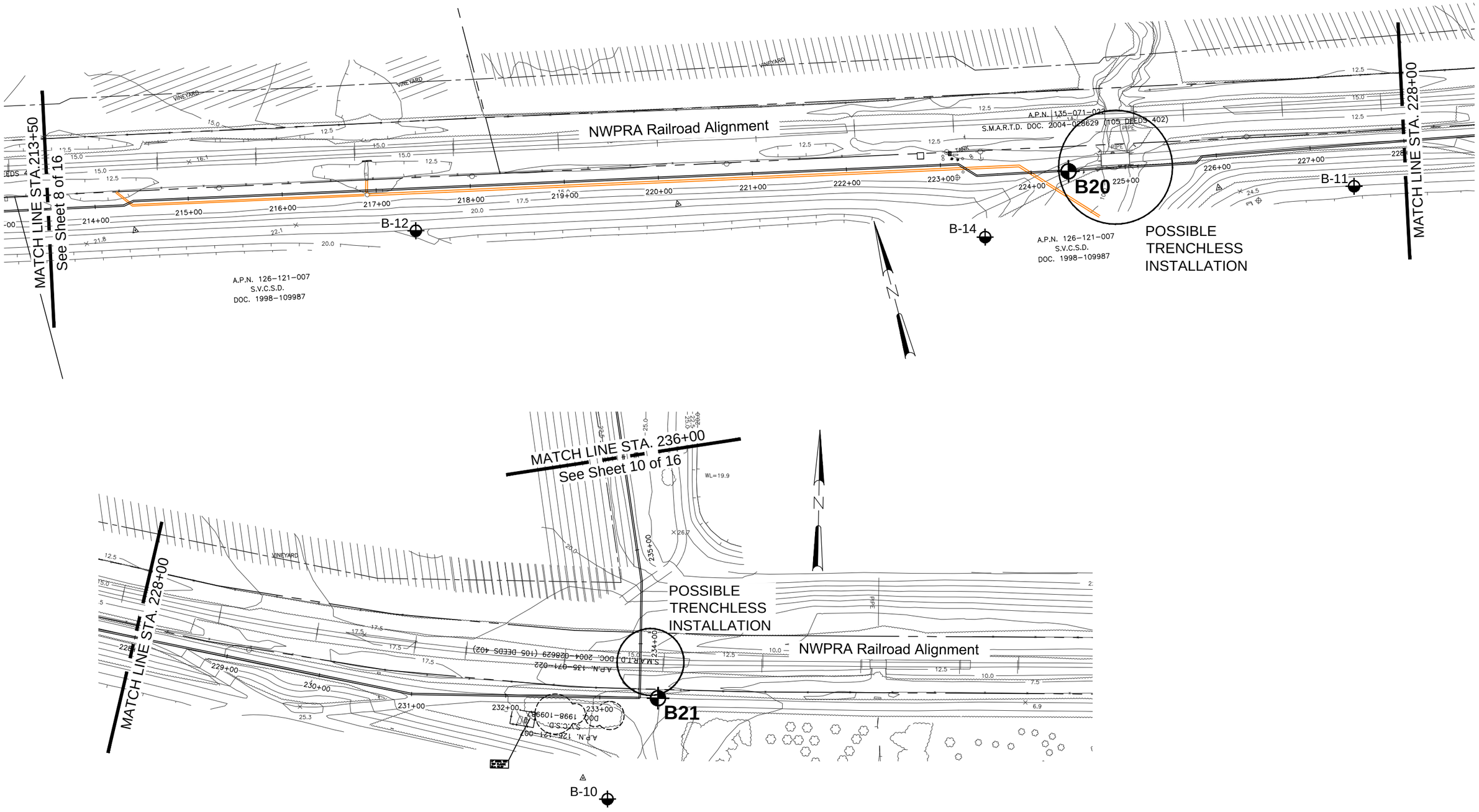
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 8 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg



LEGEND

B01 Approximate Boring Location

B-10 - Approximate Taber Boring Location (Drilled 1999-see Appendix A)

SCALE: 1"=100'

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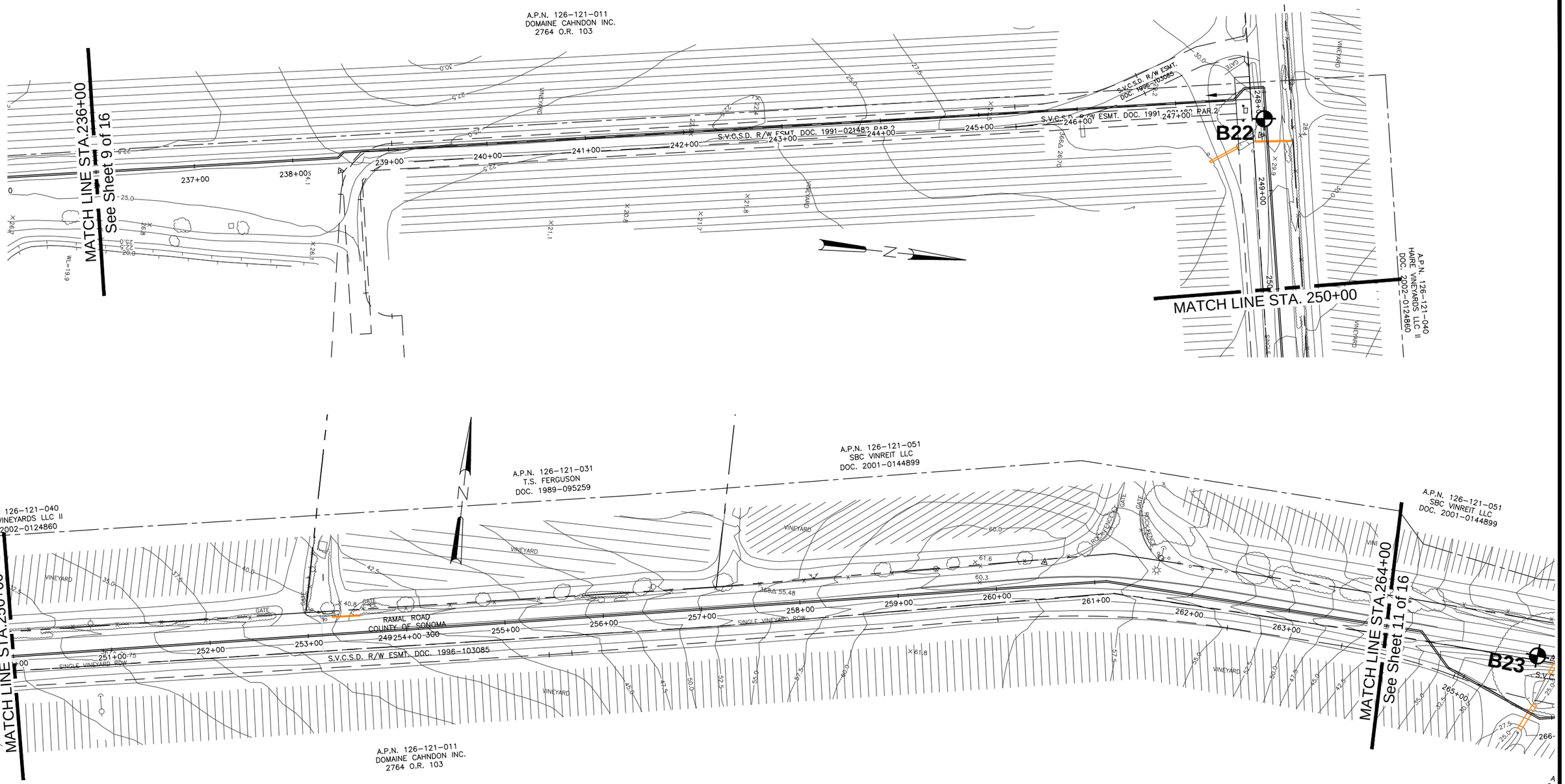
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 9 of 16



LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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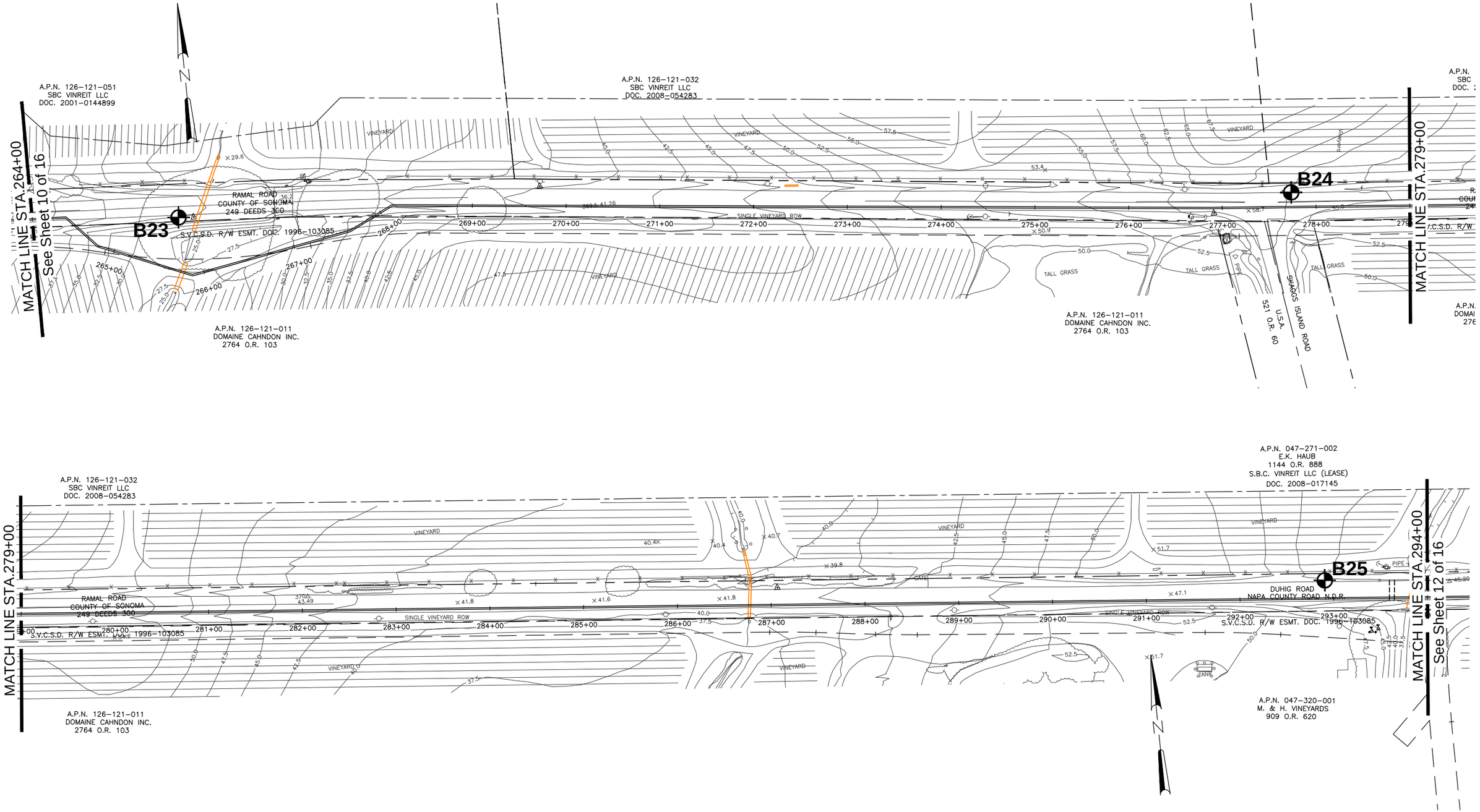
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 10 of 16



LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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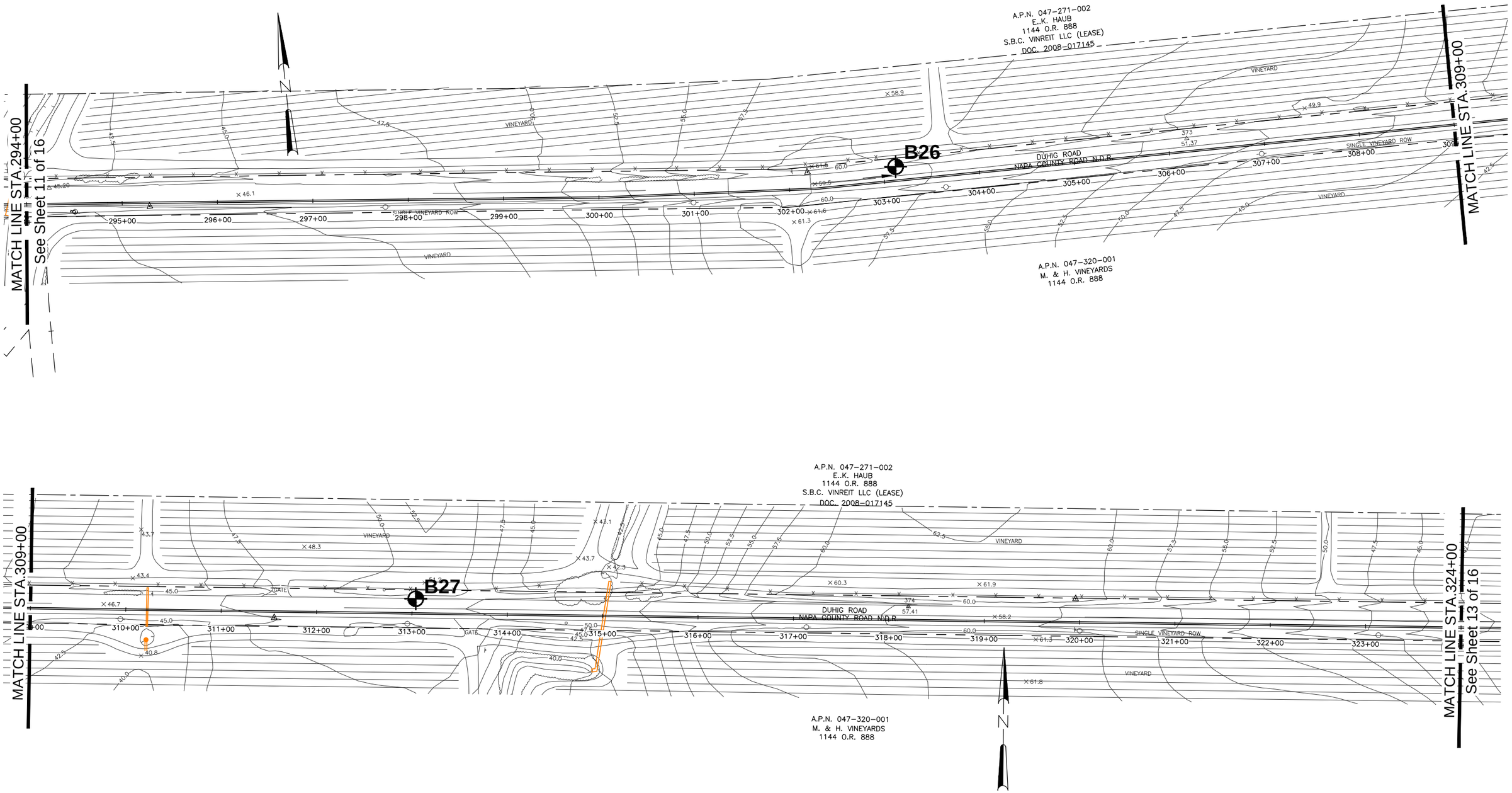
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 11 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg



LEGEND

B01 Approximate Boring Location

SCALE: 1"=100'

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BORING LOCATION MAP

Napa-Sonoma Salt Marsh Restoration Pipeline
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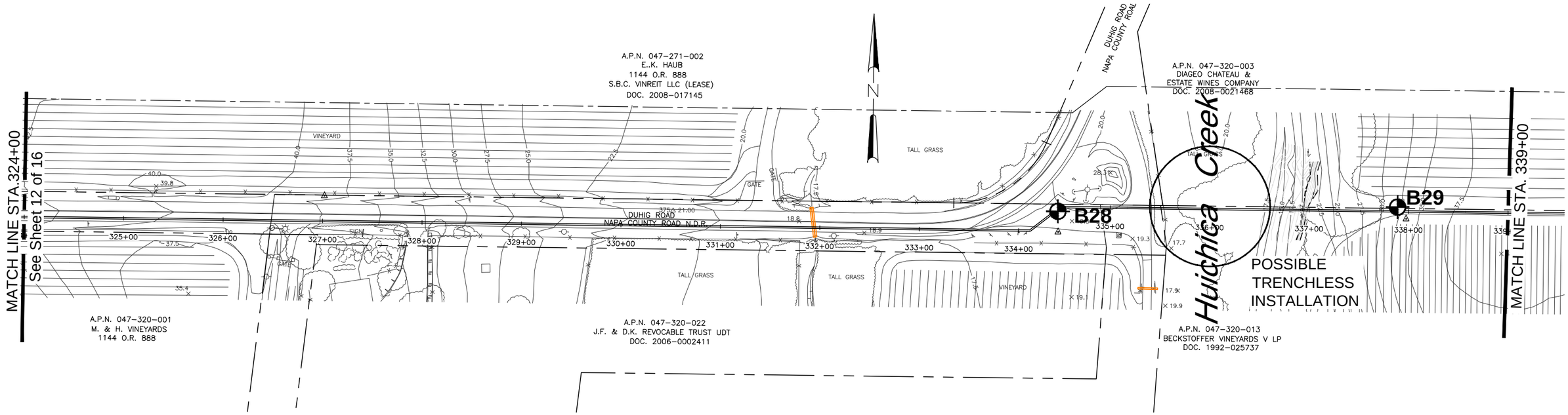
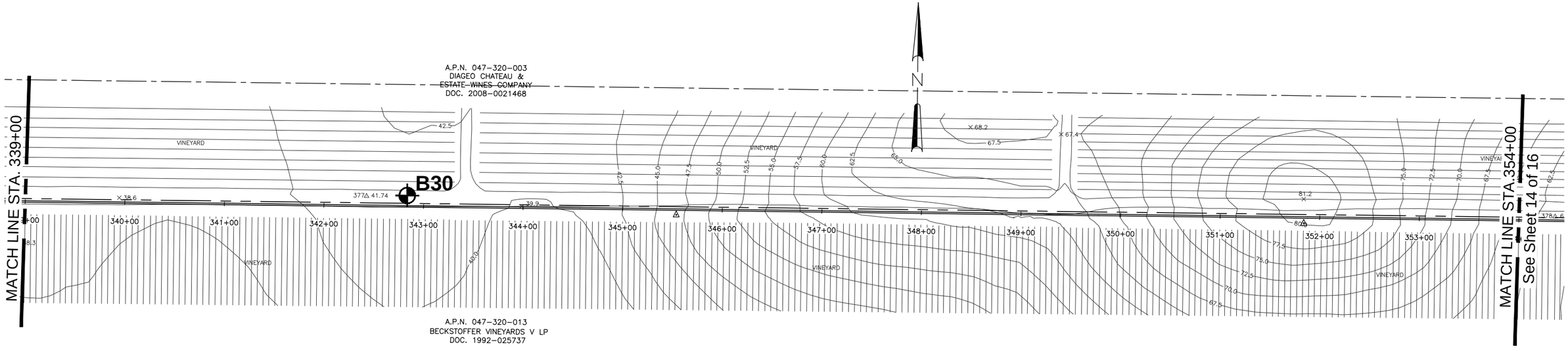
File No. 2049.1

April 2011

Appendix B
Sheet 12 of 16





LEGEND

B01 Approximate Boring Location

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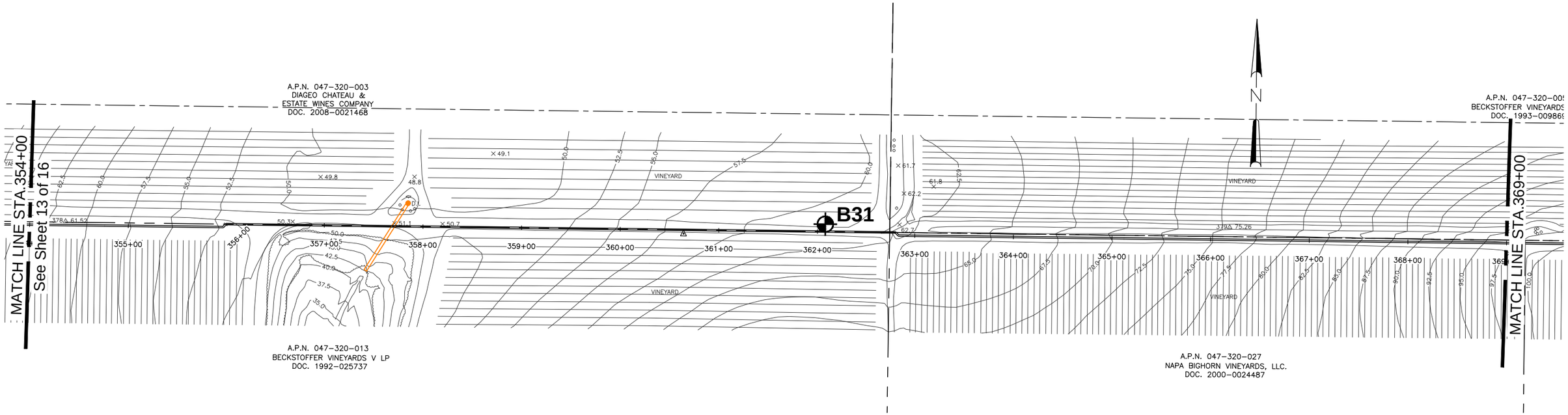
BORING LOCATION MAP

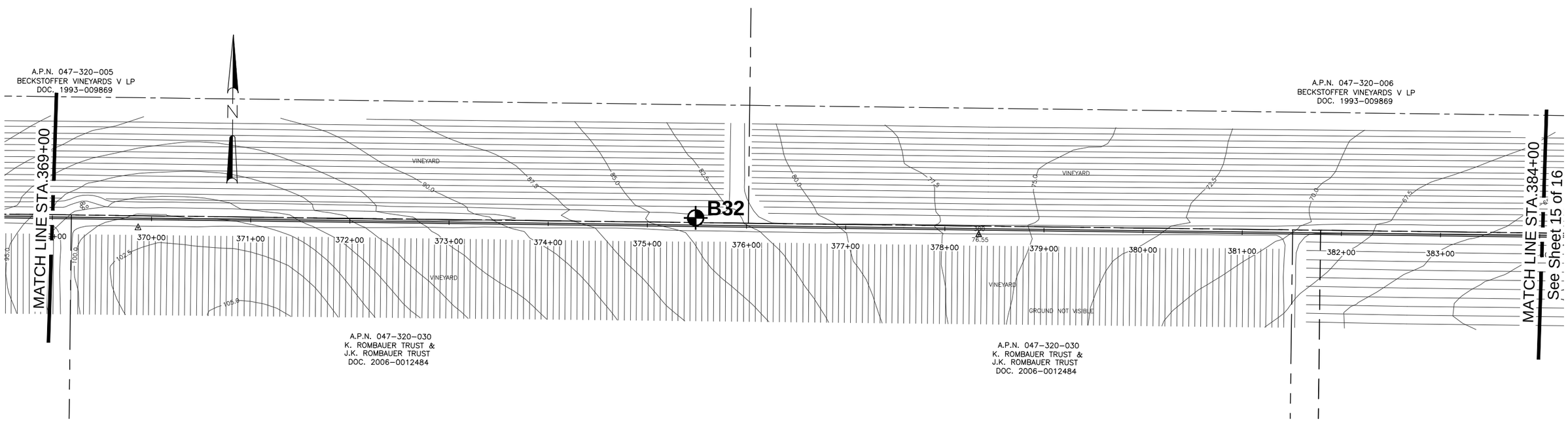
Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix B
Sheet 13 of 16





LEGEND

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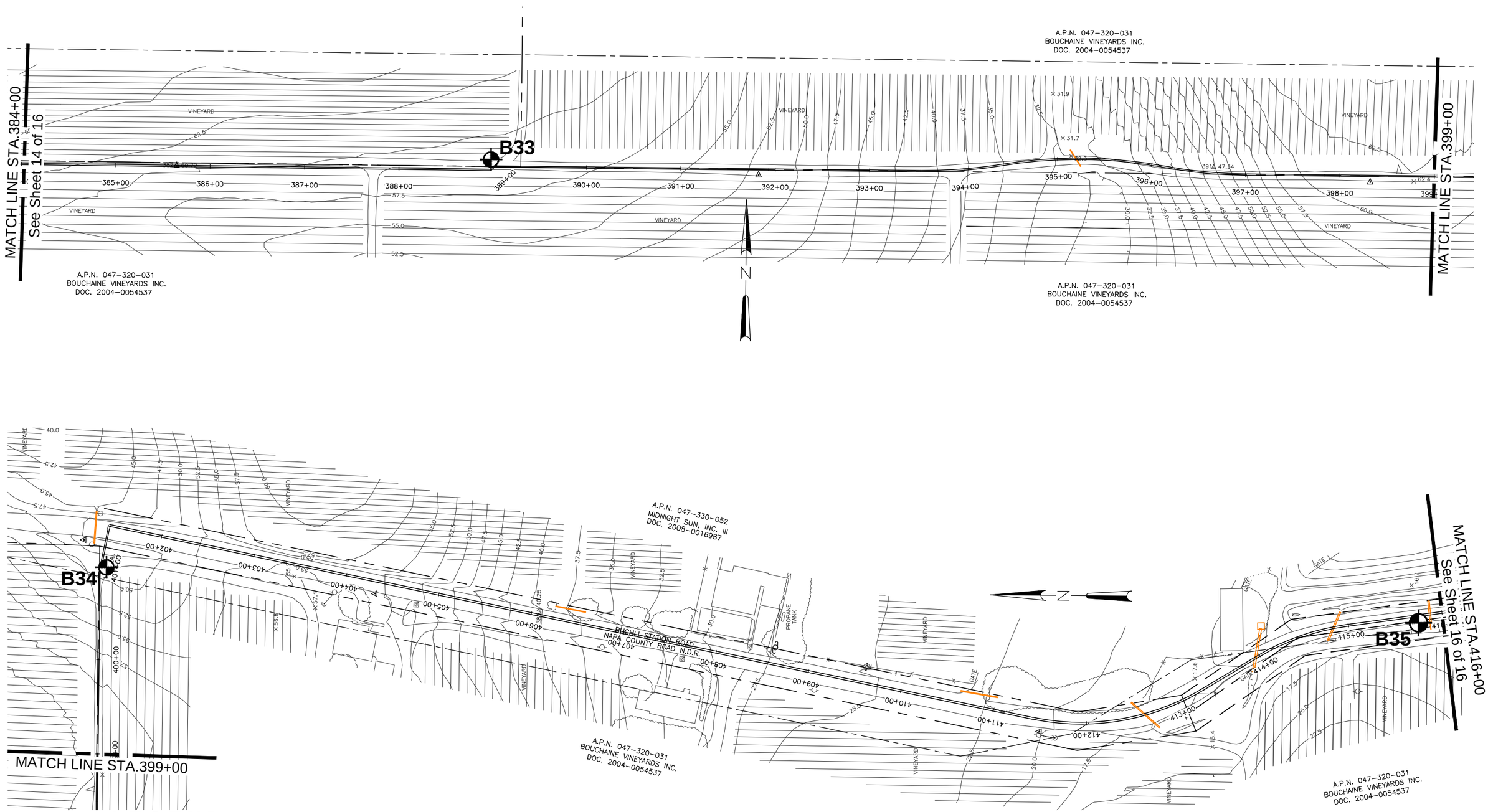
File No. 2049.1

April 2011

Appendix B
Sheet 14 of 16



LEGEND

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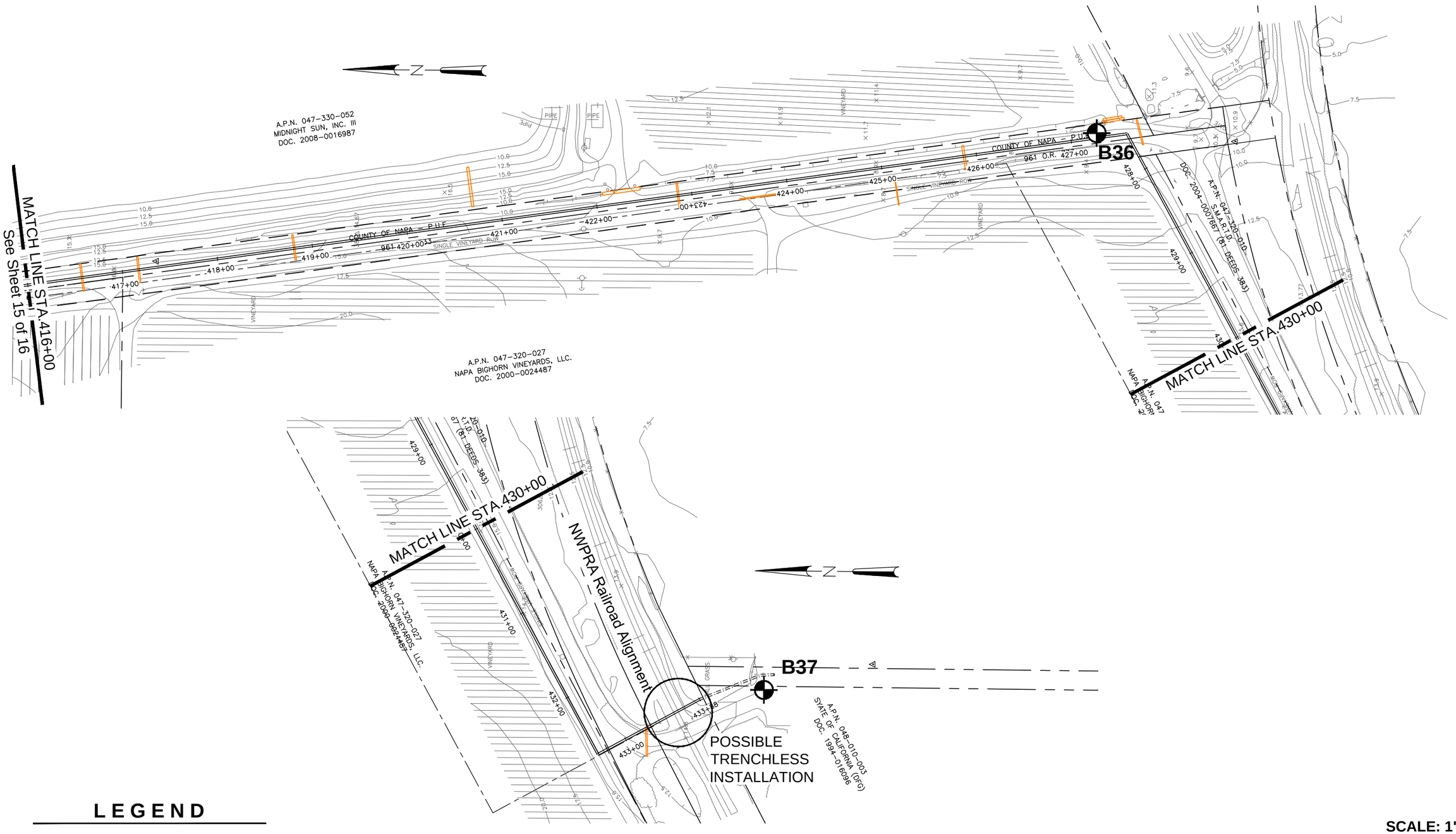
File No. 2049.1

April 2011

Appendix B
Sheet 15 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg



LEGEND

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BORING LOCATION MAP

Napa-Sonoma Salt Marsh Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1
April 2011
Appendix B
Sheet 16 of 16

4/20/2011 2049.1 Appendix B Boring Location Map.dwg

APPENDIX C

Boring Logs (BCI 2010); B1, B2, and B4 through B37

Legend of Boring Logs

Trenchless Crossing Profiles (Stations 22+00, 39+00, 157+50, 225+00, 234+00, 336+00, 443+00)

Well Construction Detail – B5, B21, B28, and B36

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-3-10	3-22-11	38° 15' 2.43" / -122° 26' 27.14"	B01
DRILLING CONTRACTOR: Precision and Taber			BOREHOLE LOCATION (Offset, Station, Line): 5.00' Lt Sta 19+50	SURFACE ELEVATION: 18.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon, SPT (1.4")			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 18.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 38.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with SAND (CL); soft; black; moist; little medium to fine SAND; mostly fines.												
	1				1										
16.00	2				2	3 3 3	6					PP - .5			
	3		SANDY lean CLAY (CL); hard; dark gray; dry; some medium to fine SAND; mostly fines.							25	92				
14.00	4														
	5				3	5 9 33	42			39	79	PP - >4.5			
12.00	6														
	7		Lean CLAY with SAND (CL); hard; dark brown; dry; little medium to fine SAND; mostly fines.												
10.00	8														
	9														
8.00	10				4	7 18 29	47			24	100	PP - >4.5			
	11														
6.00	12														
	13														
4.00	14														
	15				5	3 4 6	10					PP - 2.5			
2.00	16		SILTY SAND (SM); dense; brown; wet; mostly medium to fine SAND; some fines.												
	17				6	7 14 20	34								
0.00	18														
	19														
	20														

(continued)

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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B01
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	20		Well-graded SAND with SILT and GRAVEL (SW-SM); dense; dark brown; wet; some coarse to fine GRAVEL; mostly coarse to medium SAND; few fines.		7	7 13 30	43			15	118	PP - >4.5			
	21														
-4.00	22														
	23		Lean CLAY with SAND (CL); hard; dark brown; wet; little fine SAND; mostly fines.												
-6.00	24														
	25				8	9 18 23	41			32	94	PP - >4.5			
-8.00	26		SILTY SAND with GRAVEL (SM); dense; greenish gray; wet; little coarse to fine GRAVEL; mostly coarse to fine SAND; little fines.												
	27														
-10.00	28														
	29														
-12.00	30				9	16 16 16	32			22	108	PP - >4.5			
	31		Lean CLAY with SAND (CL); stiff to very stiff; greenish gray; wet; little fine SAND; mostly fines.												
-14.00	32														
	33														
-16.00	34														
	35				10	3 5 11	16			21	108	PP - 1.75			
-18.00	36														
	37		Poorly graded GRAVEL with CLAY and SAND (GP-GC); medium dense to dense; greenish gray; wet; mostly coarse to fine GRAVEL; little coarse to fine SAND; little fines.		11	5 12 16	28								
-20.00	38		Bottom of borehole at 38.0 ft bgs												
	39														
-22.00	40														
	41														
-24.00	42														
	43														
	44														

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PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B01**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 14' 59.24" / -122° 26' 26.02"	B02
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 37.00' Lt Sta 23+13	SURFACE ELEVATION: 18.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT 4" AC over 3" AB.												
	1	Well-graded SAND with GRAVEL (SW); dense; dark brown; dry; little fine GRAVEL; mostly coarse to fine SAND.												
16.00	2			1	43	44								
	3				22									
					22									
14.00	4													
	5			2	3	17					PP - 2.2			
12.00	6	Lean CLAY (CL); stiff to very stiff; black; moist; mostly fines.			7				28	91				
					10									
	7													
10.00	8													
	9													
8.00	10			3	6	19					PP - 4.0			
	11	SANDY lean CLAY (CL); very stiff; dark brown; dry; some medium to fine SAND; mostly fines.			9									
					10									
6.00	12													
	13	Poorly graded GRAVEL with CLAY and SAND (GP-GC); very dense; dark brown; moist; mostly fine GRAVEL; little medium to fine SAND; few fines.												
4.00	14													
	15			4	13	57								
2.00	16				25									
					32									
	17	Bottom of borehole at 16.5 ft bgs												
0.00	18													
	19													
	20													

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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B02
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-3-10	11-3-10	38° 14' 46.63" / -122° 26' 19.78"	B04
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 37.00' Lt Sta 37+50	SURFACE ELEVATION: 16.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with SAND (CL); hard; dark brown; moist; little medium to fine SAND; mostly fines.												
	1														
14.00	2				1	22	29					PP -			
	3					15 14				14	106	>4.5			
12.00	4		Poorly graded SAND with SILT (SP-SM); dense; brown; moist; mostly coarse to fine SAND; little fines.												
	5				2	16	50/6								
10.00	6		SILT with SAND (ML); hard; brown; moist; few fine SAND; mostly fines.			50/6"				19	102	PP - >4.5			
	7		CLAYEY SAND (SC); medium dense; brown; moist; mostly medium SAND; some fines.												
8.00	8														
	9														
6.00	10				3	5	16								
	11					7 9				33	90				
4.00	12														
	13														
2.00	14														
	15				4	6	14					PP -			
0.00	16					7 7						0.75			
	17		Bottom of borehole at 16.5 ft bgs												
-2.00	18														
	19														
	20														

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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B04
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-3-10	11-3-10	38° 14' 44.91" / -122° 26' 17.29"	B05
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 25.00' Lt Sta 39+96	SURFACE ELEVATION: 17.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 17.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 21.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0–1	Poorly graded GRAVEL with CLAY and SAND (GP-GC); loose to medium dense; grayish brown; moist; mostly fine GRAVEL; few medium to fine SAND; few fines.												
15.00	2	CLAYEY SAND (SC); medium dense; dark brown; moist; some medium to fine SAND; some fines.		1										
				2	23 5 6	11					PP - 2			
	3	SILT (ML); hard; brown; moist; mostly fines.							17	94				
13.00	4													
	5	SANDY lean CLAY (CL); hard; brown; moist; mostly SAND.		3	3 4 6	10					PP - >4.5			
11.00	6								29	92				
9.00	7–8													
	9	SANDY SILT (ML); very stiff to hard; brown; moist; some medium to fine SAND; mostly fines.												
7.00	10			4	6 13 18	31					PP - 3.5			
	11								27	94				
5.00	12													
	13	CLAYEY SAND (SC); medium dense; brown; moist; mostly medium SAND; some fines.												
3.00	14													
	15			5	3 3 8	11								
1.00	16								31	92				
	17	Well-graded SAND with SILT and GRAVEL (SW-SM); dense; reddish brown; wet; some coarse to fine GRAVEL; some coarse to fine SAND; few fines.												
-1.00	18–19													
-3.00	20			6	6 20 17	37								
	21								23	104				
	22	Bottom of borehole at 21.5 ft bgs												

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B05
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-6-10	10-6-10	38° 14' 28.24" / -122° 26' 8.82"	B06
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 430.00' Rt Sta 56+72	SURFACE ELEVATION: 12.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 16.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Poorly graded GRAVEL with CLAY and SAND (GP-GC); very dense; grayish brown; dry; mostly coarse GRAVEL; little medium SAND; few fines.												
10.00	2				1	14 30 27	57			11	111				
8.00	4		SANDY lean CLAY with GRAVEL (CL); stiff; reddish brown; moist; little coarse to fine GRAVEL; some coarse to fine SAND; mostly fines.												
6.00	6				2	7 12 21	33			14	110	PP - 1.5			
4.00	8		SANDY SILT (ML); hard; brown; moist; some fine SAND; mostly fines.												
2.00	10				3	10 18 31	49					PP - >4.5			
0.00	12														
-2.00	14		Lean CLAY with SAND (CL); stiff; brown; moist; some medium to fine SAND; mostly fines.												
-4.00	16				4	5 7 13	20					PP - 1.5			
	16.5		Bottom of borehole at 16.5 ft bgs												

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Auburn, CA 95603
Phone: (530) 887-1494
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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B06
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-6-10	10-6-10	38° 14' 26.44" / -122° 25' 53.47"	B07
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 300.00' Rt Sta 69+24	SURFACE ELEVATION: 8.0 ft
DRILLING METHOD: Rotary Wash			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 9.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 51.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean to fat CLAY with SAND (CL/CH); very stiff; black; moist; little medium to fine SAND; mostly fines.												
	1													
6.00	2			1										
	3			2	4 5 6	11			22	89	PP - 3.7			
4.00	4													
	5			3	2 8 15	23			23	104	PP - >4.5			
2.00	6	SANDY lean CLAY (CL); hard; brown; moist; some medium SAND; mostly fines.												
	7													
0.00	8	Well-graded SAND with CLAY (SW-SC); dense; dark brown; wet; mostly coarse to fine SAND; little fines.												
	9													
-2.00	10			4	10 16 22	38								
	11													
-4.00	12													
	13													
-6.00	14	SANDY lean CLAY (CL); very stiff; brown; wet; some medium to fine SAND; mostly fines.												
	15			5	12 42 29	71			28	96	PP - >4.5			
-8.00	16													
	17													
-10.00	18													
	19													
-12.00	20			6	5 9 11	20			33	91	PP - 3.2			
	21													
-14.00	22													
	23													
-16.00	24	CLAYEY SAND (SC); medium dense to dense; brown; wet; mostly medium to fine SAND; some fines.												
	25													

(continued)

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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B07
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	25		CLAYEY SAND (SC) *(continued)*.		7	9 14 17	31								
-18.00	26														
	27														
-20.00	28		SANDY lean CLAY (CL); very stiff; brown; wet; little medium to fine SAND; mostly fines.												
	29														
-22.00	30				8	7 11 17	28					PP - 4.0			
	31														
-24.00	32														
	33														
-26.00	34														
	35				9	7 10 13	23					PP - 3.2			
-28.00	36		Fat CLAY (CH); very stiff; bluish gray; wet; trace medium SAND; mostly fines.												
	37														
-30.00	38														
	39														
-32.00	40				10	6 9 10	19					PP - 2.5			
	41														
-34.00	42														
	43														
-36.00	44		Fat CLAY with SAND (CH); stiff; black; wet; little medium to fine SAND; mostly fines.												
	45				11	6 19 15	34					PP - 1.7			
-38.00	46														
	47														
-40.00	48		Fat CLAY with SAND (CH); hard; bluish gray; wet; little medium to fine SAND; mostly fines.												
	49														
-42.00	50				12	11 23 31	54					PP - >4.5			
	51														
-44.00	52		Bottom of borehole at 51.5 ft bgs												
	53														
-46.00	54														
	55														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B07**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-5-10	10-5-10	38° 14' 26.09" / -122° 25' 51.95"	B08
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 315.00' Rt Sta 70+06	SURFACE ELEVATION: 8.0 ft
DRILLING METHOD: Rotary Wash			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 9.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 51.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Lean to fat CLAY with SAND (CL/CH); stiff; black; moist; little medium SAND; mostly fines.												
	1														
6.00	2				1	3 2 6	8			16	113	PP - 1.75			
	3														
4.00	4														
	5				2	2 3 9	12	0							
2.00	6														
	7														
0.00	8		SILTY SAND with GRAVEL (SM); dense; brown; wet; little fine GRAVEL; mostly coarse to fine SAND; some fines.												
	9														
-2.00	10				3	14 14 32	46								
	11														
-4.00	12														
	13														
-6.00	14		Poorly graded GRAVEL (GP); medium dense; grayish brown; wet; mostly coarse GRAVEL.												
	15				4	5 10 14	24			29	95	PP - >4.5			
-8.00	16		Lean CLAY with SAND (CL); very stiff to hard; brown; wet; little medium to fine SAND; mostly fines.												
	17														
-10.00	18														
	19														
-12.00	20				5	8 11 12	23			33	89	PP - 2.25			
	21														
-14.00	22														
	23														
-16.00	24														
	25														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B08
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	25		Lean CLAY with SAND (CL)*(continued)*.		6	10 16 20	36					PP - >4.5			
-18.00	26														
	27														
-20.00	28		SANDY lean CLAY (CL); very stiff to hard; brown; wet; some fine SAND; mostly fines.												
	29														
-22.00	30				7	8 10 12	22								
	31														
-24.00	32														
	33														
-26.00	34		Poorly graded SAND with SILT (SP-SM); medium dense; dark brown; wet; mostly medium to fine SAND; little fines.												
	35				8	10 11 15	26								
-28.00	36														
	37														
-30.00	38		CLAYEY SAND (SC); dense; brown; wet; mostly fine SAND; some fines.												
	39														
-32.00	40				9	8 14 22	36								
	41														
-34.00	42														
	43														
-36.00	44		SANDY lean CLAY (CL); hard; grayish brown; wet; some fine SAND; mostly fines.												
	45				10	18 29 31	60					PP - >4.5			
-38.00	46														
	47														
-40.00	48														
	49														
-42.00	50				11	16 21 35	56					PP - >4.5			
	51														
-44.00	52		Bottom of borehole at 51.5 ft bgs												
	53														
-46.00	54														
	55														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B08**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-6-10	10-6-10	38° 14' 24.27" / -122° 25' 40.14"	B09
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 230.00' Rt Sta 77+00	SURFACE ELEVATION: 6.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 15.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 26.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); medium dense; brown; dry; mostly medium to fine SAND; some fines.												
	1														
4.00	2				1	9	23					PP - >4.5			
	3					11 12				17	96				
2.00	4														
	5				2	9	36					PP - >4.5			
0.00	6					18 18				16	112				
	7		CLAYEY GRAVEL with SAND (GC); dense; dark brown; dry; mostly coarse to fine GRAVEL; few medium SAND; some fines.												
-2.00	8		Lean to fat CLAY with SAND (CL/CH); very stiff; brown; dry; little fine SAND; mostly fines.												
	9														
-4.00	10				3	5	22					PP - 2.5			
	11					10 12				28	94				
-6.00	12														
	13														
-8.00	14														
	15				4	5	24					PP - 2.5			
-10.00	16					10 14									
	17														
-12.00	18		SANDY lean CLAY (CL); hard; brown; moist; some medium to fine SAND; mostly fines.												
	19														
	20														

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Auburn, CA 95603
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PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B09
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	20		SANDY lean CLAY (CL)*(continued)*.		5	10 15 20	35					PP - >4.5			
	21														
-16.00	22														
	23														
-18.00	24		SILT (ML); hard; brown; moist; trace SAND; mostly fines.												
	25				6	10 18 27	45					PP - >4.5			
-20.00	26														
	27		Bottom of borehole at 26.5 ft bgs												
-22.00	28														
	29														
-24.00	30														
	31														
-26.00	32														
	33														
-28.00	34														
	35														
-30.00	36														
	37														
-32.00	38														
	39														
-34.00	40														
	41														
-36.00	42														
	43														
	44														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B09**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 14' 22.8" / -122° 25' 26.09"	B10
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 2.00' Lt Sta 91+06	SURFACE ELEVATION: 7.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 12.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 21.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); very dense; brown; dry; mostly medium to fine SAND; some fines.												
	1														
5.50	2				1										
					2	5 21 50/3"	71/9					PP - >4.5			
	3									14	114				
3.50	4		Poorly graded SAND with SILT (SP-SM); dense; dark brown; moist; mostly medium to fine SAND; some fines.												
	5				3	15 18 31	49					PP - >4.5			
1.50	6									20	104				
	7														
-0.50	8		Lean CLAY with SAND (CL); hard; dark brown; moist; few medium to fine SAND; mostly fines.												
	9														
-2.50	10				4	10 17 23	40			28	95	PP - >4.5			
	11														
-4.50	12														
	13														
-6.50	14		Poorly graded SAND with SILT (SP-SM); medium dense; dark brown; wet; mostly medium to fine SAND; some fines.												
	15				5	4 5 5	10								
-8.50	16														
	17														
-10.50	18		Well-graded SAND with SILT and GRAVEL (SW-SM); very dense; dark brown; wet; few fine GRAVEL; mostly coarse to fine SAND; few fines.												
	19														
-12.50	20				6	6 25 27	52								
	21														
	22		Bottom of borehole at 21.5 ft bgs												

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B10
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 14' 17.02" / -122° 25' 18.01"	B11

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber	6.00' Rt Sta 99+74	8.5 ft

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger	CME 75	4"

SAMPLER TYPE(S) AND SIZE(S) (ID)	HAMMER TYPE	HAMMER EFFICIENCY, ERi
2.5" Split Spoon	Automatic, 140lb, 30 in.	~75%

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
grout		None observed		11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SILTY SAND (SM); medium dense; brown; dry; mostly medium to fine SAND; some fines.												
	1													
6.50	2			1	5	14					PP - 3.5			
	3				5 9				9	105				
4.50	4	SANDY lean CLAY with GRAVEL (CL); hard; light gray; moist; few fine GRAVEL; little medium to fine SAND; mostly fines.												
	5			2	5	25					PP - >4.5			
2.50	6				10 15									
	7													
0.50	8													
	9													
-1.50	10			3	15	79					PP - >4.5			
	11				47 32				12	122				
		Bottom of borehole at 11.5 ft bgs												
-3.50	12													
	13													
-5.50	14													
	15													
-7.50	16													
	17													
-9.50	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B11

COUNTY	ROUTE	POSTMILE
SON		

CLIENT
Camp Dresser & McKee

PREPARED BY	CHECKED BY	SHEET
DPC	PFF	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 14' 6.35" / -122° 25' 2.4"	B12
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 6.00' Lt Sta 116+42	SURFACE ELEVATION: 9.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 9.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with SAND (CL); hard; light brown; dry; few medium to fine SAND; mostly fines.												
	1				1										
7.50	2				2	8 10 15	25					PP - >4.5			
	3									14	115				
5.50	4		SILT (ML); hard; light brown; dry to moist.												
	5				3	7 15 24	39					PP - >4.5			
3.50	6									28	95				
	7		SILTY SAND (SM); medium dense; brown; moist to wet; mostly medium to fine SAND; some fines.												
1.50	8														
	9														
-0.50	10				4	8 13 14	27					PP - >4.5			
	11									26	98				
-2.50	12														
	13														
-4.50	14		Poorly graded SAND with SILT (SP-SM); loose to medium dense; brown; wet; mostly medium to fine SAND; some fines.												
	15				5	3 4 3	7								
-6.50	16														
	17		Bottom of borehole at 16.5 ft bgs												
-8.50	18														
	19														
	20														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B12
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 13' 59.45" / -122° 24' 52.37"	B13
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 10.00' Lt Sta 126+98	SURFACE ELEVATION: 12.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY with SAND (CL); hard; brown; dry; few medium to fine SAND; mostly fines.												
	1													
10.00	2	SILT (ML); stiff to very stiff; brown; dry; trace medium to fine SAND; mostly fines.		1	5 7 11	18					PP - 2.25			
	3	Lean CLAY with SAND (CL); brown; dry; little medium to fine SAND; mostly fines.							16	98				
8.00	4													
	5			2	4 13 22	35					PP - >4.5			
6.00	6													
	7	SILT with SAND (ML); very stiff; brown; moist; few medium to fine SAND; mostly fines.												
4.00	8													
	9													
2.00	10			3	5 7 10	17					PP - 2.0			
	11													
0.00	12	Bottom of borehole at 11.5 ft bgs												
	13													
-2.00	14													
	15													
-4.00	16													
	17													
-6.00	18													
	19													
	20													

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B13
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 13' 53.46" / -122° 24' 44.14"	B14

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber	28.00' Rt Sta 135+90	14.5 ft

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger	CME 75	4"

SAMPLER TYPE(S) AND SIZE(S) (ID)	HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, 2.5" Split Spoon	Automatic, 140lb, 30 in.	~75%

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
grout		None observed		11.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY SILT (ML); hard; light yellowish brown; dry; some medium to fine SAND; mostly fines.												
	1														
					1										
12.50	2				2	14 20 50	70					PP - >4.5			
	3														
10.50	4		Lean CLAY with SAND (CL); hard; brown; dry; few medium to fine SAND; mostly fines.												
	5				3	7 15 29	44					PP - >4.5			
8.50	6														
	7														
6.50	8														
	9														
4.50	10				4	7 14 21	35					PP - >4.5			
	11														
2.50	12		Bottom of borehole at 11.5 ft bgs												
	13														
0.50	14														
	15														
-1.50	16														
	17														
-3.50	18														
	19														
	20														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B14

COUNTY	ROUTE	POSTMILE
SON		

CLIENT
Camp Dresser & McKee

PREPARED BY	CHECKED BY	SHEET
DPC	PFF	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 13' 46.97" / -122° 24' 34.55"	B15
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 14.00' Rt Sta 145+96	SURFACE ELEVATION: 15.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY (CL); hard; dark brown; dry; mostly fines.												
	1													
13.00	2			1	5	18					PP -			
					7						>4.5			
	3				11				16	99				
11.00	4	SILT (ML); very stiff; light brown; dry; mostly fines.												
	5			2	4	12					PP - 2.0			
					5									
9.00	6				7									
	7													
7.00	8	Poorly graded GRAVEL with SAND (GP); dense; reddish brown; dry; mostly coarse to fine GRAVEL; little medium to fine SAND.												
	9													
5.00	10			3	12	35					PP - 3.0			
					19									
	11				16									
		SILT (ML); very stiff; light brown; moist; mostly fines.												
3.00	12	Bottom of borehole at 11.5 ft bgs												
	13													
1.00	14													
	15													
-1.00	16													
	17													
-3.00	18													
	19													
	20													

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B15
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	9-30-10	9-30-10	38° 13' 39.55" / -122° 24' 23.98"	B16
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 5.00' Lt Sta 157+08	SURFACE ELEVATION: 13.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 21.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY with SAND (CL); hard; very dark brown; dry; few medium to fine SAND; mostly fines.												
	1													
11.00	2			1	6 8 10	18					PP - >4.5			
	3	Becomes silty.							9	92				
9.00	4	CLAYEY GRAVEL with SAND (GC); dense; light brown; moist; mostly coarse to fine GRAVEL; few medium to fine SAND; some fines.												
	5			2	8 17 24	41					PP - >4.5			
7.00	6	SILT with SAND (ML); very stiff; little medium to fine SAND; mostly fines.												
	7													
5.00	8													
	9													
3.00	10			3	11 11 10	21					PP - 3.75			
	11								17	113				
1.00	12													
	13													
-1.00	14													
	15			4	7 11 13	24					PP - 3.5			
-3.00	16													
	17													
-5.00	18													
	19													
-7.00	20			5	8 11 16	27					PP - 4.5			
	21													
	22	Bottom of borehole at 21.5 ft bgs												

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B16
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-1-10	10-1-10	38° 13' 30.08" / -122° 24' 10.73"	B17
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 38.00' Rt Sta 171+90	SURFACE ELEVATION: 13.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 15.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 26.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	GRAVELLY lean CLAY with SAND (CL); hard; dark brown; dry; some coarse to fine GRAVEL; little medium to fine SAND; mostly fines.												
	1			1										
11.50	2			2	7 16 17	33					PP - >4.5			
	3								10	116				
		Lean CLAY (CL); stiff; dark brown; moist; mostly fines.												
9.50	4													
	5			3	4 7 11	18					PP - 2.0			
7.50	6													
	7													
		Lean CLAY with SAND (CL); hard; brown; moist; little medium to fine SAND; mostly fines.												
5.50	8													
	9													
3.50	10			4	6 11 16	27					PP - >4.5			
	11								21	107				
1.50	12													
	13													
		CLAYEY SAND with GRAVEL (SC); very dense; dark brown; wet; few coarse to fine GRAVEL; mostly fine SAND; little fines.												
-0.50	14													
	15			5	10 14 46	60								
-2.50	16													
	17													
		Lean CLAY with SAND (CL); very stiff; brown; wet; little medium to fine SAND; mostly fines.												
-4.50	18													
	19													
	20													

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B17
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	20		Lean CLAY with SAND (CL)*(continued)*.		6	7 10 13	23					PP - 3.75			
	21														
-8.50	22														
	23														
-10.50	24		SANDY lean CLAY (CL); hard; brown; wet; some fine SAND; mostly fines.												
	25				7	9 20 23	43					PP - >4.5			
-12.50	26														
	27		Bottom of borehole at 26.5 ft bgs												
-14.50	28														
	29														
-16.50	30														
	31														
-18.50	32														
	33														
-20.50	34														
	35														
-22.50	36														
	37														
-24.50	38														
	39														
-26.50	40														
	41														
-28.50	42														
	43														
	44														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B17**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-1-10	10-1-10	38° 13' 20.51" / -122° 23' 53.36"	B18
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 35.00' Rt Sta 188+56	SURFACE ELEVATION: 12.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 12.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 21.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); hard; dark brown; dry; some fine SAND; mostly fines.												
	1														
10.50	2				1	9	22					PP - 4.5			
	3					13 9				8	100				
8.50	4		Lean CLAY (CL); very stiff; yellowish brown; moist; mostly fines.												
	5				2	6	30					PP - 3.75			
6.50	6					11 19				23	99				
	7														
4.50	8														
	9														
2.50	10				3	7	19					PP - 3.75			
	11					6 13									
0.50	12														
	13														
-1.50	14		SANDY lean CLAY (CL); very stiff; yellowish brown; wet; some fine SAND; mostly fines.												
	15				4	7	16					PP - 2.5			
-3.50	16					7 9									
	17		SANDY lean CLAY with GRAVEL (CL); hard; yellowish brown; wet; few coarse to fine GRAVEL; some medium to fine SAND; mostly fines.												
-5.50	18														
	19														
-7.50	20				5	21	85/11					PP - >4.5			
	21					35 50/5"									
	22		Bottom of borehole at 21.5 ft bgs												

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B18
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-1-10	10-1-10	38° 13' 15.8" / -122° 23' 40.84"	B19
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 4.00' Rt Sta 199+70	SURFACE ELEVATION: 13.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SANDY lean CLAY (CL); dark brown; moist; some medium to fine SAND; mostly fines.												
	1			1										
11.50	2			2	5 5 6	11			24	100	PP - 1.75			
	3	Lean CLAY (CL); medium stiff to stiff; light gray; moist; mostly fines.												
9.50	4													
	5	CLAYEY SAND with GRAVEL (SC); loose to medium dense; reddish brown; moist; few fine GRAVEL; mostly fine SAND; some fines.		3	5 6 5	11			16	109	PP - 3.0			
7.50	6	SANDY lean CLAY (CL); very stiff; dark gray; moist; some medium to fine SAND; mostly fines.												
	7													
5.50	8													
	9	CLAYEY GRAVEL with SAND (GC); very dense; light brown; moist; unknown, could be rock..												
3.50	10			4	16 35 50/5"	85/11								
	11													
1.50	12													
	13													
-0.50	14													
	15			5	30 50/6"	50/6								
-2.50	16													
	17	Bottom of borehole at 16.5 ft bgs												
-4.50	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B19
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-1-10	10-1-10	38° 13' 10.58" / -122° 23' 10.84"	B20
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 1.00' Rt Sta 224+40	SURFACE ELEVATION: 13.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon, SPT (1.4")			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 16.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 31.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); hard; black; moist; some fine SAND; mostly fines.												
	1														
11.00	2				1	6 8 6	14					PP - >4.5			
	3									14	91				
9.00	4														
	5				2	5 6 12	18	0							
7.00	6		SANDY lean CLAY (CL); very stiff; light gray; moist; some fine SAND; mostly fines.												
	7				3	5 8 13	21					PP - 2.75			
5.00	8		CLAYEY SAND with GRAVEL (SC); very dense; brown; wet; little fine GRAVEL; mostly medium to fine SAND; some fines.							17	114				
	9														
3.00	10				4	11 50/5"	50/5								
	11														
1.00	12														
	13														
-1.00	14		CLAYEY GRAVEL with SAND (GC); very dense; reddish brown; wet; could have some rock, unknown.												
	15				5	11 24 37	61								
-3.00	16														
	17														
-5.00	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B20
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	20		CLAYEY GRAVEL with SAND (GC)*(continued)*.		6	18 21 27	48								
	21														
-9.00	22														
	23														
-11.00	24		Well-graded GRAVEL with CLAY and SAND (GW-GC); medium dense; dark brown; wet; mostly coarse to fine GRAVEL; little medium to fine SAND; little fines; no samples from this layer.												
	25				7	4 7 10	17	0							
-13.00	26														
	27		Blowcount of 6 likely no good due to sample disturbance.		8	1 2 4	6	0							
-15.00	28														
	29														
-17.00	30				9	7 7 8	15								
	31		Lean CLAY with SAND (CL); soft to medium stiff; yellowish brown; wet; little medium to fine SAND; mostly fines.												
-19.00	32		Bottom of borehole at 31.5 ft bgs												
	33														
-21.00	34														
	35														
-23.00	36														
	37														
-25.00	38														
	39														
-27.00	40														
	41														
-29.00	42														
	43														
	44														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B20**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 9.54" / -122° 22' 59.02"	B21
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 19.50' Rt Sta 233+42	SURFACE ELEVATION: 12.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 15.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY with GRAVEL (CL); hard; grayish brown; moist; few fine GRAVEL; little medium to fine SAND; mostly fines.												
	1				1										
10.50	2				2	8 8 12	20			19	108	PP - >4.5			
	3														
8.50	4														
	5				3	9 15 30	45			26	92	PP - 3.0			
6.50	6		SANDY lean CLAY with GRAVEL (CL); very stiff; yellowish brown; moist; few coarse to fine GRAVEL; some medium to fine SAND; mostly fines; weak to moderate cementation.												
	7														
4.50	8		CLAYEY GRAVEL with SAND (GC); very dense; dark brown; moist; mostly coarse to fine GRAVEL; few medium to fine SAND; some fines.												
	9														
2.50	10				4	25 44 50/5"	94/11								
	11														
0.50	12														
	13														
-1.50	14														
	15				5	12 11 13	24								
-3.50	16														
	17		Bottom of borehole at 16.5 ft bgs												
-5.50	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B21
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 23.67" / -122° 23' 2.27"	B22
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 0.00' Rt Sta 248+28	SURFACE ELEVATION: 30.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	ASPHALT 4" AC over 4" AB.												
	1	SILT with SAND (ML); hard; dark brown; moist; little coarse to fine SAND; mostly fines.												
28.00	2			1	14 16 14	30					PP - >4.5			
	3													
26.00	4													
	5			2	9 20 31	51			19	96	PP - >4.5			
24.00	6	SANDY SILT (ML); hard; yellowish brown; dry; some medium to fine SAND; mostly fines.												
	7													
22.00	8	CLAYEY GRAVEL with SAND (GC); very dense; grayish brown; dry; mostly coarse to fine GRAVEL; little medium to fine SAND; some fines.												
	9													
20.00	10			3	16 30 31	61					PP - >4.5			
	11													
18.00	12	Bottom of borehole at 11.5 ft bgs												
	13													
16.00	14													
	15													
14.00	16													
	17													
12.00	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B22
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 25.71" / -122° 22' 40.84"	B23

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Precision	54.00' Lt Sta 265+56	38.0 ft

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger	CME 75	8"

SAMPLER TYPE(S) AND SIZE(S) (ID)	HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, 2.5" Split Spoon	Automatic, 140lb, 30 in.	~75%

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
grout		None observed		16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT 4" AC over 5" AB.												
	1		SANDY lean CLAY (CL); hard; brown; dry; little fine SAND; mostly fines; Road embankment fill..												
					1										
36.00	2				2	9	20					PP -			
						10						>4.5			
	3					10				17	92				
34.00	4														
			SILT with SAND (ML); very stiff; light brown; dry; little fine SAND; mostly fines.												
	5				3	5	16					PP - 3.6			
						7									
32.00	6					9				16	96				
	7														
			SANDY lean CLAY (CL); hard; black; moist; some medium to fine SAND; mostly fines.												
30.00	8														
	9														
28.00	10				4	5	19					PP - 4.2			
						9									
	11		Some silt layers.			10				12	93				
26.00	12														
	13		Lean CLAY (CL); very stiff; light brown; moist; mostly fines.												
24.00	14														
	15				5	5	22					PP - 2.6			
						9									
22.00	16					13				26	95				
			Bottom of borehole at 16.5 ft bgs												
	17														
20.00	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME		FILE NO.	HOLE ID
Napa-Sonoma Pipeline		2049.1	B23
COUNTY: SON	ROUTE	POSTMILE	
CLIENT: Camp Dresser & McKee			
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 24.77" / -122° 22' 25.78"	B24
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 14.00' Lt Sta 277+74	SURFACE ELEVATION: 58.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	GRAVELLY lean CLAY with SAND (CL); very stiff; brown; moist; some coarse to fine GRAVEL; little medium to fine SAND; mostly fines; Road embankment fill?.												
56.00	2	SANDY SILT (ML); hard; yellowish brown; dry; some medium to fine SAND; mostly fines.		1	7 8 11	19					PP - 3.2			
54.00	4	SANDY lean CLAY with GRAVEL (CL); hard; yellowish brown; dry; little fine GRAVEL; some medium to fine SAND; mostly fines.												
52.00	6			2	10 24 30	54					PP - >4.5			
48.00	10	SILTY SAND (SM); dense to very dense; yellowish brown; dry; mostly medium to fine SAND; some fines.		3	6 17 28	45					PP - >4.5			
46.00	12	Bottom of borehole at 11.5 ft bgs												

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Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B24
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 23.54" / -122° 22' 7.93"	B25
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 20.00' Lt Sta 292+90	SURFACE ELEVATION: 47.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		GRAVELLY lean CLAY with SAND (CL); hard; dark brown; moist; some coarse to fine GRAVEL; few medium to fine SAND; mostly fines; Upper 1 to 2 feet is road embankment fill..												
	1				1										
45.00	2				2	4 11 30	41			22	102	PP - >4.5			
	3		SANDY SILT (ML); hard; yellowish brown; dry; some coarse to fine SAND; mostly fines; moderate to strong cementation.												
43.00	4														
	5				3	8 17 28	45			27	97	PP - >4.5			
41.00	6														
	7														
39.00	8														
	9														
37.00	10				4	5 12 16	28			26	93	PP - >4.5			
	11														
35.00	12														
	13		SILT with SAND (ML); hard; yellowish brown; dry; some coarse to fine SAND; mostly fines.												
33.00	14														
	15				5	6 15 18	33			23	106	PP - >4.5			
31.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
29.00	18														
	19														
	20														

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B25
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 22.69" / -122° 21' 54.51"	B26
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 15.00' Lt Sta 303+12	SURFACE ELEVATION: 58.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Fat CLAY (CH); hard; light brown; moist; mostly fines.												
	1													
56.00	2			1	4	17					PP - >4.5			
	3				6 11									
54.00	4	SILT with SAND (ML); very stiff; reddish brown; moist; few medium to fine SAND; mostly fines.												
	5			2	13	38					PP - 2.5			
52.00	6				16 22									
	7	SILT (ML); hard; light brown; moist; mostly fines.												
50.00	8													
	9													
48.00	10			3	8	30					PP - >4.5			
	11				13 17				24	99				
46.00	12	Bottom of borehole at 11.5 ft bgs												
	13													
44.00	14													
	15													
42.00	16													
	17													
40.00	18													
	19													
	20													

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B26
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	11-2-10	11-2-10	38° 13' 22.73" / -122° 21' 41.93"	B27
DRILLING CONTRACTOR: Precision			BOREHOLE LOCATION (Offset, Station, Line): 15.00' Lt Sta 313+04	SURFACE ELEVATION: 50.0 ft
DRILLING METHOD: Hollow-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SILT with SAND (ML); very stiff; yellowish brown; dry; few fine SAND; mostly fines.												
	1													
				1										
48.00	2			2	7 11 22	33			21	100	PP - 2.6			
	3	SANDY lean CLAY (CL); hard; reddish brown; dry; little medium to fine SAND; mostly fines.												
46.00	4													
	5			3	10 20 30	50			18	108	PP - >4.5			
44.00	6													
	7	Lean CLAY with SAND (CL); hard; yellowish brown; dry; little medium to fine SAND; mostly fines.												
42.00	8													
	9													
40.00	10			4	11 23 30	53			20	105	PP - >4.5			
	11													
38.00	12													
	13	SANDY SILT (ML); stiff; light brown; dry; some fine SAND; mostly fines.												
36.00	14													
	15			5	8 14 21	35			19	103	PP - 1.5			
34.00	16													
	17	Bottom of borehole at 16.5 ft bgs												
32.00	18													
	19													
	20													

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B27
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-5-10	10-5-10	38° 13' 22.74" / -122° 21' 14.96"	B28
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 2.00' Rt Sta 334+45	SURFACE ELEVATION: 20.0 ft
DRILLING METHOD: Rotary Wash			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 16.0 ft; AFTER DRILLING (DATE) 14.5 ft on 10-6-10	TOTAL DEPTH OF BORING: 51.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY with SAND (CL); very stiff; light brown; moist; little medium to fine SAND; mostly fines.												
18.00	2			1	6 11 19	30					PP - 2.5			
16.00	4	CLAYEY SAND with GRAVEL (SC); dense; dark brown; moist; some fine GRAVEL; mostly medium to fine SAND; little fines.												
14.00	6			2	8 15 25	40			12	103				
12.00	8	Lean CLAY with SAND (CL); hard; reddish brown; moist; little fine SAND; mostly fines.												
10.00	10			3	10 16 21	37			24	100	PP - >4.5			
8.00	12													
6.00	14													
4.00	16	Fat CLAY (CH); hard; reddish brown; moist; mostly fines.		4	5 6 15	21			27	94	PP - >4.5			
2.00	18													
0.00	20			5	10 15 31	46					PP - >4.5			
-2.00	22													
-4.00	24	SILT (ML); hard; reddish brown; moist; mostly fines.												
	25													

(continued)

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11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B28
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 2

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	25		SILT (ML) *(continued)*.		6	9 15 20	35					PP - >4.5			
-6.00	26														
	27														
-8.00	28		SANDY SILT (ML); hard; reddish brown; moist; some fine SAND; mostly fines.												
	29														
-10.00	30				7	10 19 30	49					PP - >4.5			
	31														
-12.00	32														
	33														
-14.00	34														
	35				8	8 12 15	27					PP - >4.5			
-16.00	36														
	37														
-18.00	38		Poorly graded SAND with SILT (SP-SM); dense; dark brown; wet; mostly medium to fine SAND; little fines.												
	39														
-20.00	40				9	8 16 25	41					PP - 4.5			
	41		SANDY SILT (ML); hard; reddish brown; moist; some fine SAND; mostly fines.												
-22.00	42		Poorly graded SAND with SILT (SP-SM); dense; dark brown; wet; mostly medium to fine SAND; little fines.												
	43														
-24.00	44		Well-graded SAND with CLAY and GRAVEL (SW-SC); very dense; dark brown; wet; little coarse to fine GRAVEL; mostly coarse to fine SAND; few fines.												
	45				10	12 20 34	54								
-26.00	46														
	47														
-28.00	48		Poorly graded GRAVEL with SAND (GP); dense; dark brown; wet; mostly fine GRAVEL; little medium to fine SAND.												
	49														
-30.00	50				11	8 14 29	43								
	51														
-32.00	52		Well-graded SAND with GRAVEL (SW); dense; dark brown; wet; little fine GRAVEL; mostly coarse to fine SAND.												
	53		Bottom of borehole at 51.5 ft bgs												
-34.00	54														
	55														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME **Napa-Sonoma Pipeline**		FILE NO. **2049.1**	HOLE ID **B28**
COUNTY **SON**	ROUTE	POSTMILE	
CLIENT **Camp Dresser & McKee**			
PREPARED BY **DPC**	CHECKED BY **PFF**	SHEET **2 of 2**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 22.78" / -122° 21' 10.44"	B29

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber	4.00' Lt Sta 337+89	32.4 ft

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger	CME 75	4"

SAMPLER TYPE(S) AND SIZE(S) (ID)	HAMMER TYPE	HAMMER EFFICIENCY, ERi
2.5" Split Spoon	Automatic, 140lb, 30 in.	~75%

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
cuttings		None observed		21.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); very stiff; brown; moist; little medium to fine SAND; mostly fines.												
	1														
30.40	2				1	3	23					PP - 3.0			
	3					9 14				21	98				
28.40	4		SANDY lean CLAY (CL); hard; light brown; dry; mostly medium to fine SAND; mostly fines.												
	5				2	23	73					PP - >4.5			
26.40	6					30 43									
	7														
24.40	8														
	9														
22.40	10				3	9	48					PP - >4.5			
	11					20 28				19	103				
20.40	12														
	13														
18.40	14		Lean CLAY with SAND (CL); hard; light reddish brown; dry; little medium to fine SAND; mostly fines.												
	15				4	9	47					PP - >4.5			
16.40	16					16 31				25	100				
	17														
14.40	18														
	19														
12.40	20				5	7	33								
	21					15 18									
	22		Bottom of borehole at 21.5 ft bgs												

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B29

COUNTY	ROUTE	POSTMILE
SON		

CLIENT
Camp Dresser & McKee

PREPARED BY	CHECKED BY	SHEET
DPC	PFF	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 22.92" / -122° 20' 56.91"	B30
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 10.00' Lt Sta 342+82	SURFACE ELEVATION: 41.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: cuttings			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with SAND (CL); stiff to very stiff; brown; moist; little medium to fine SAND; mostly fines.												
	1														
39.50	2				1	4	14					PP - 2.0			
	3					6 8				24	94				
37.50	4		Poorly graded GRAVEL with CLAY and SAND (GP-GC); very dense; reddish brown; dry; mostly coarse to fine GRAVEL; little medium to fine SAND; few fines.												
	5				2	19	50/6								
35.50	6					50/6"									
	7														
33.50	8														
	9														
31.50	10				3	11	49					PP - >4.5			
	11					24 25				15	113				
			Bottom of borehole at 11.5 ft bgs												
29.50	12														
	13														
27.50	14														
	15														
25.50	16														
	17														
23.50	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B30
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 22.91" / -122° 20' 40.38"	B31
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 10.00' Lt Sta 362+10	SURFACE ELEVATION: 61.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: cuttings			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SANDY lean CLAY (CL); very stiff; dark brown; dry; some fine SAND; mostly fines.												
	1													
59.50	2			1										
				2	7 6 8	14								
	3													
57.50	4	SILT with SAND (ML); hard; yellowish brown; dry; some fine SAND; mostly fines.												
	5			3	5 13 22	35					PP - >4.5			
55.50	6													
	7													
53.50	8													
	9													
51.50	10			4	17 36 42	78					PP - >4.5			
	11													
49.50	12													
	13													
47.50	14	CLAYEY SAND with GRAVEL (SC); dense; dark reddish brown; moist; few coarse to fine GRAVEL; mostly medium to fine SAND; little fines.												
	15			5	15 21 28	49								
45.50	16													
	17	Bottom of borehole at 16.5 ft bgs												
43.50	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B31
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 22.85" / -122° 20' 23.67"	B32
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 8.00' Lt Sta 375+50	SURFACE ELEVATION: 83.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: cuttings			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SANDY SILTY CLAY (CL-ML); very stiff; dark brown; moist; some medium to fine SAND; mostly fines.												
	1													
81.00	2			1	5 4 8	12					PP - 3.2			
	3	SANDY SILTY CLAY (CL-ML); hard; yellowish brown; dry; some medium to fine SAND; mostly fines.												
79.00	4													
	5			2	7 17 23	40			23	100	PP - >4.5			
77.00	6													
	7													
75.00	8													
	9													
73.00	10	Becomes more clayey.		3	6 14 18	32					PP - >4.5			
	11													
71.00	12	Bottom of borehole at 11.5 ft bgs												
	13													
69.00	14													
	15													
67.00	16													
	17													
65.00	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B32
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-6-10	10-6-10	38° 13' 22.89" / -122° 20' 6.94"	B33
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 10.00' Lt Sta 388+98	SURFACE ELEVATION: 59.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: cuttings			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	SANDY lean CLAY (CL); hard; dark reddish brown; moist; some fine SAND; mostly fines.												
	1													
57.00	2			1										
				2	4 5 12	17			13	116	PP - >4.5			
	3													
55.00	4	CLAYEY SAND with GRAVEL (SC); medium dense; dark reddish brown; moist; few fine GRAVEL; some coarse to fine SAND; some fines.												
	5													
				3	6 7 9	16			17	106				
53.00	6													
	7													
51.00	8	SANDY lean CLAY (CL); hard; yellowish brown; dry; some medium to fine SAND; mostly fines.												
	9													
49.00	10													
				4	12 15 25	40			20	109				
	11													
47.00	12													
	13													
45.00	14	Lean CLAY with SAND (CL); hard; yellowish brown; dry; little medium to fine SAND; mostly fines.												
	15													
				5	8 13 22	35					PP - >4.5			
43.00	16													
	17	Bottom of borehole at 16.5 ft bgs												
41.00	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B33
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 22.72" / -122° 19' 51.71"	B34
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 6.00' Rt Sta 400+98	SURFACE ELEVATION: 48.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: cuttings			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 11.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY with GRAVEL (CL); hard; dark brown; moist; few coarse to fine GRAVEL; some medium to fine SAND; mostly fines.												
	1														
46.50	2				1	3	15					PP - 4.5			
	3					4 11				14	108				
44.50	4														
	5				2	3	14					PP - 1.25			
42.50	6		SILT (ML); stiff to very stiff; yellowish brown; moist; mostly fines.			6 8									
	7														
40.50	8														
	9														
38.50	10				3	5	25					PP - 3.75			
	11					9 16				26	95				
36.50	12		Bottom of borehole at 11.5 ft bgs												
	13														
34.50	14														
	15														
32.50	16														
	17														
30.50	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B34
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	10-4-10	10-4-10	38° 13' 9.17" / -122° 19' 52.37"	B35
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 7.00' Rt Sta 415+76	SURFACE ELEVATION: 16.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 10.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); stiff; dark brown; moist; little medium to fine SAND; mostly fines.												
	1				1										
14.00	2				2	4 4 5	9			17	106	PP - 1.5			
	3														
			Lean CLAY with GRAVEL (CL); very stiff; grayish brown; moist; few coarse to fine GRAVEL; mostly fines.												
12.00	4														
	5				3	5 11 15	26			15	110	PP - 3.5			
10.00	6														
	7														
			SILT (ML); hard; light gray; moist.												
8.00	8														
	9														
6.00	10				4	10 22 32	54			25	101	PP - >4.5			
	11														
4.00	12														
	13														
			SANDY SILT (ML); hard; light gray; moist; some medium to fine SAND; mostly fines.												
2.00	14														
	15				5	8 17 30	47					PP - >4.5			
0.00	16														
			Bottom of borehole at 16.5 ft bgs												
	17														
-2.00	18														
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B35
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	4-4-11	4-4-11	38° 12' 57.64" / -122° 19' 49.94"	B36
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 10.00' Lt Sta 427+24	SURFACE ELEVATION: 8.5 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 8"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING 15.0 ft; AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: 18.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY with GRAVEL (CL); stiff; dark brown; moist; few fine GRAVEL; some fine SAND; mostly fines.												
	1				1										
6.50	2		CLAYEY SAND with GRAVEL (SC); medium dense to dense; reddish brown; moist; little coarse to fine GRAVEL; mostly coarse to fine SAND; some fines.		2	3 4 8	12			23	93	PP - 2.0			
4.50	4														
	5				3	12 17 25	42			19	106	PP - >4.5			
2.50	6														
	7		SANDY lean to fat CLAY (CL/CH); stiff to very stiff; brown; moist; little fine SAND; mostly fines.												
0.50	8														
	9														
-1.50	10				4	9 14 14	28			28	97	PP - 3.0			
	11														
-3.50	12														
	13														
-5.50	14														
	15				5	4 5 8	13					PP - 1.5			
-7.50	16														
	17				6	2 4 5	9					PP - 1.5			
-9.50	18		Bottom of borehole at 18.0 ft bgs												
	19														
	20														

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B36
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DPC	3-22-11	3-22-11	38° 12' 53.26" / -122° 19' 54.55"	B37
DRILLING CONTRACTOR: Taber			BOREHOLE LOCATION (Offset, Station, Line): 16.00' Rt Sta 434+54	SURFACE ELEVATION: 9.0 ft
DRILLING METHOD: Solid-Stem Auger			DRILL RIG: CME 75	BOREHOLE DIAMETER: 4"
SAMPLER TYPE(S) AND SIZE(S) (ID): Bulk, 2.5" Split Spoon			HAMMER TYPE: Automatic, 140lb, 30 in.	HAMMER EFFICIENCY, ERi: ~75%
BOREHOLE BACKFILL AND COMPLETION: grout			GROUNDWATER READINGS: DURING DRILLING: None observed; AFTER DRILLING (DATE):	TOTAL DEPTH OF BORING: 16.5 ft

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Strength (PP-tsf/UC-psi)	Drilling Method	Casing Depth	Remarks
	0	Lean CLAY with GRAVEL (CL); medium stiff; brown; moist; little coarse to fine GRAVEL; mostly fines.												
	1			1										
7.00	2			2	3 4 6	10			26	98	PP - 0.7			
	3	Fat CLAY (CH); medium stiff to stiff; brown; moist; mostly fines.												
5.00	4													
	5			3	5 6 8	14			32	88	PP - 1.0			
3.00	6													
	7	SANDY lean CLAY (CL); hard; olive brown; moist; some medium to fine SAND; mostly fines.												
1.00	8													
	9													
-1.00	10			4	7 12 16	28			23	103	PP - >4.5			
	11													
-3.00	12													
	13													
-5.00	14													
	15			5	7 12 17	29			27	102	PP - >4.5			
-7.00	16													
	17	Bottom of borehole at 16.5 ft bgs												
-9.00	18													
	19													
	20													

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Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

PROJECT NAME	FILE NO.	HOLE ID
Napa-Sonoma Pipeline	2049.1	B37
COUNTY: SON	ROUTE	POSTMILE
CLIENT: Camp Dresser & McKee		
PREPARED BY: DPC	CHECKED BY: PFF	SHEET: 1 of 1

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- 2.5" Split Spoon Sampler
- 2" Split Spoon Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

blackburn consulting

Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495

BORING RECORD LEGEND

COUNTY	ROUTE	POSTMILE
Sonoma		

PROJECT OR BRIDGE NAME
Napa-Sonoma Pipeline

PREPARED BY	DATE	SHEET
DPC	**4/28/2011**	**1 of 2**

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

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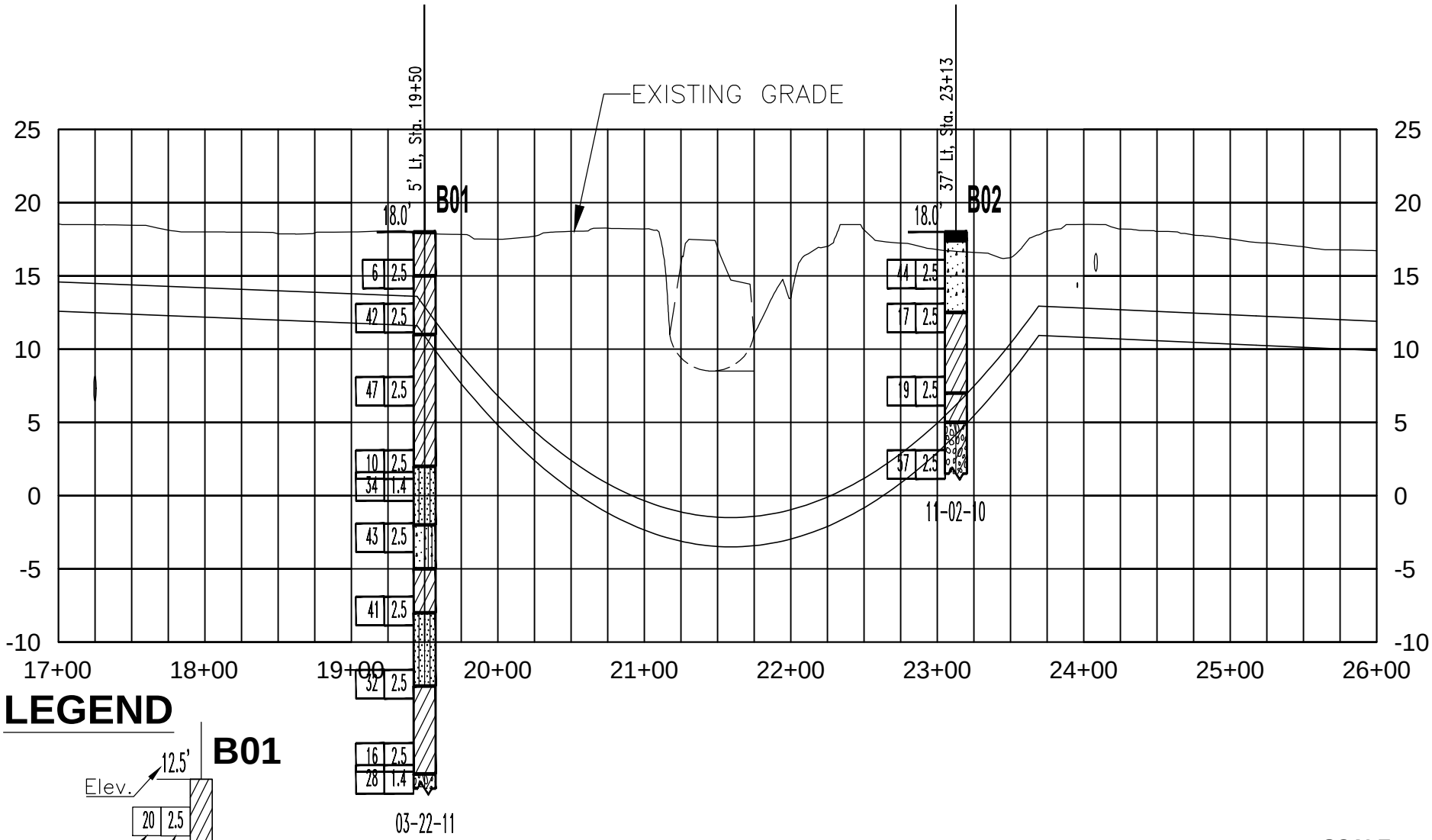
BORING RECORD LEGEND

COUNTY	ROUTE	POSTMILE
Sonoma		

PROJECT OR BRIDGE NAME: Napa-Sonoma Pipeline

PREPARED BY	DATE	SHEET
DPC	4/28/2011	2 of 2



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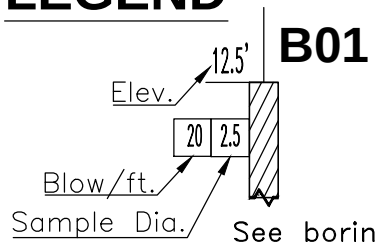

See boring logs for material description.

SCALE:
1"=100 Horiz.
1"=10' vert.

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PROFILE AT STA 22+00

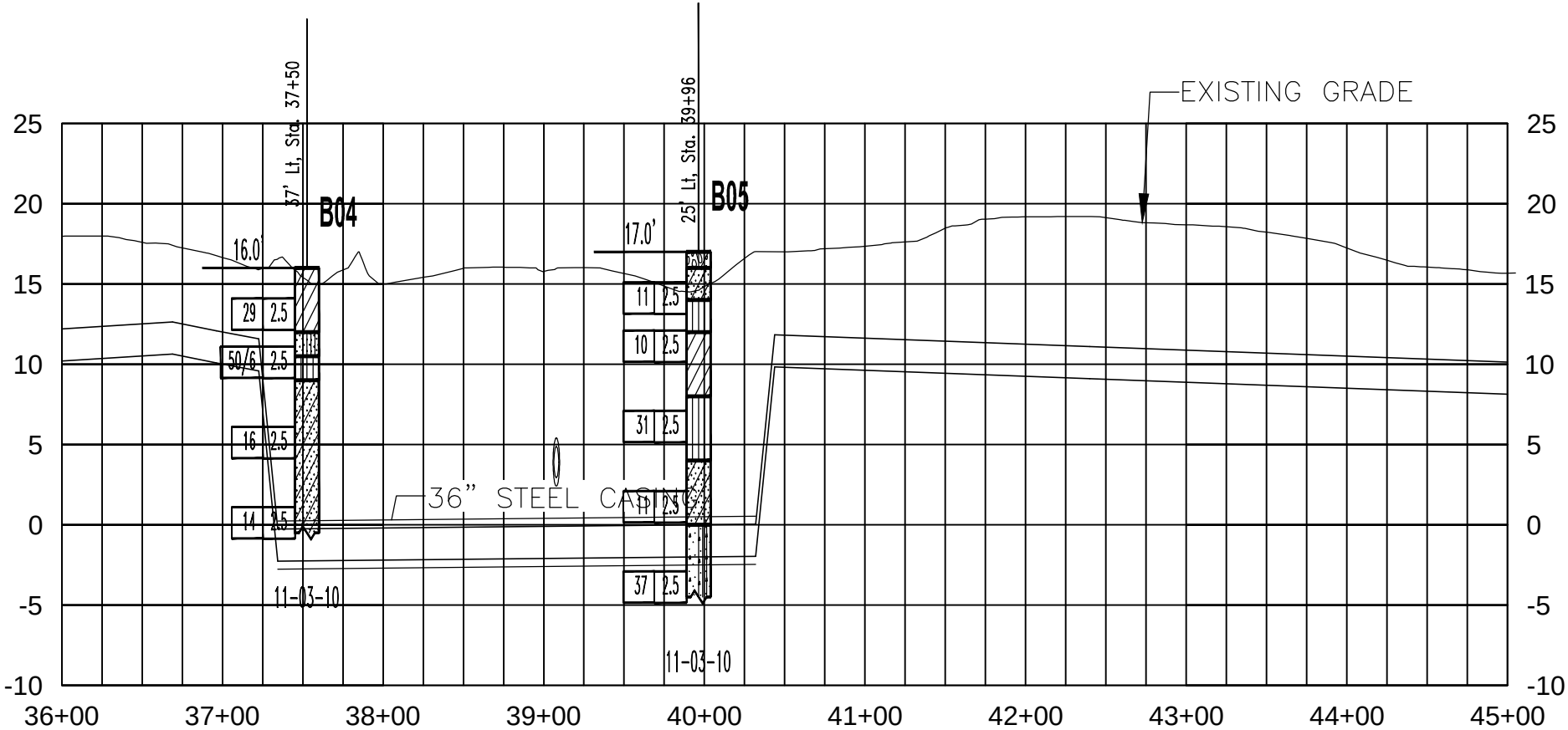
Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C

4/26/2011 2049.1 Appendix C Profile Plans.dwg



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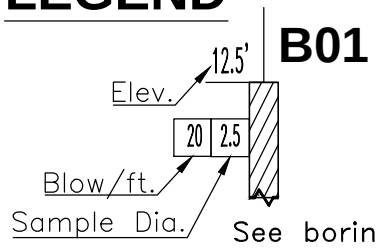

See boring logs for material description.

SCALE:
1"=100 Horiz.
1"=10' vert.

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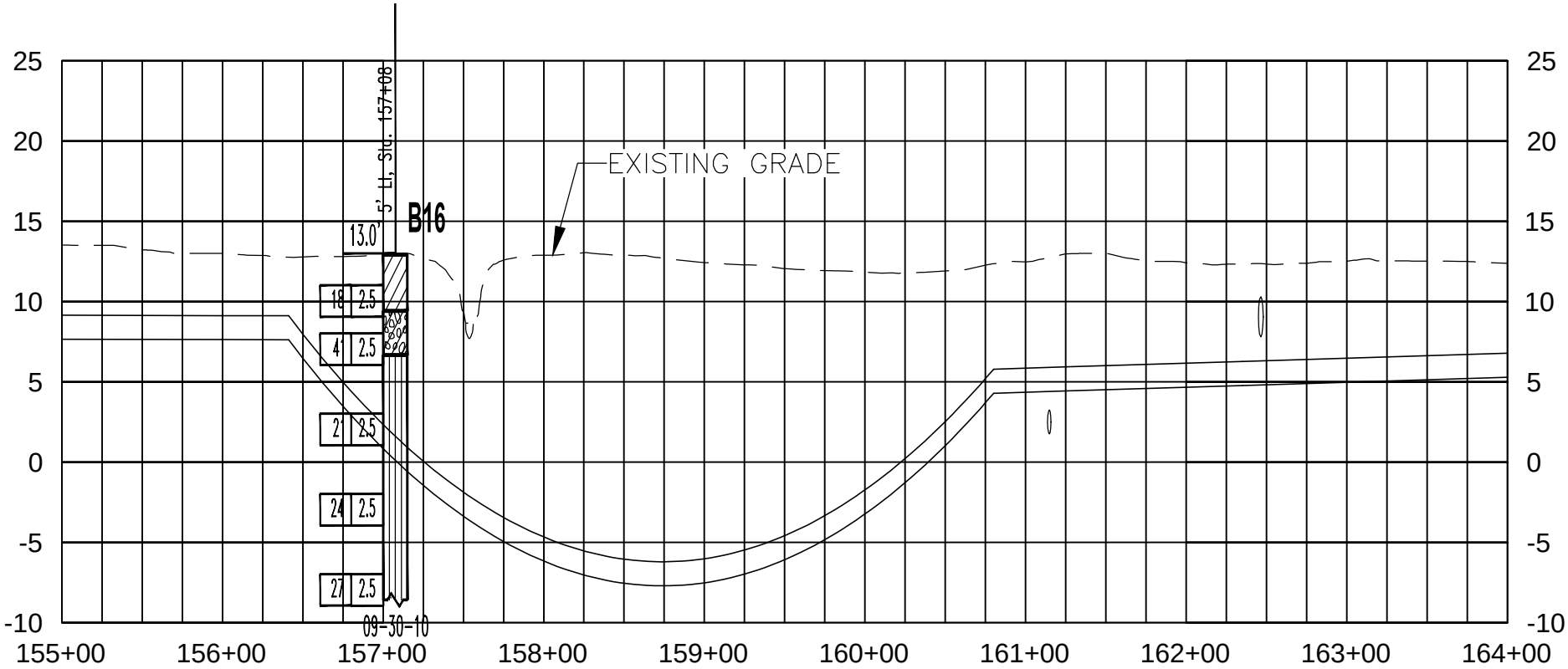
PROFILE AT STA 39+00

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C



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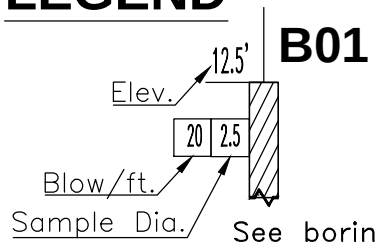

See boring logs for material description.

SCALE:
1"=100 Horiz.
1"=10' vert.

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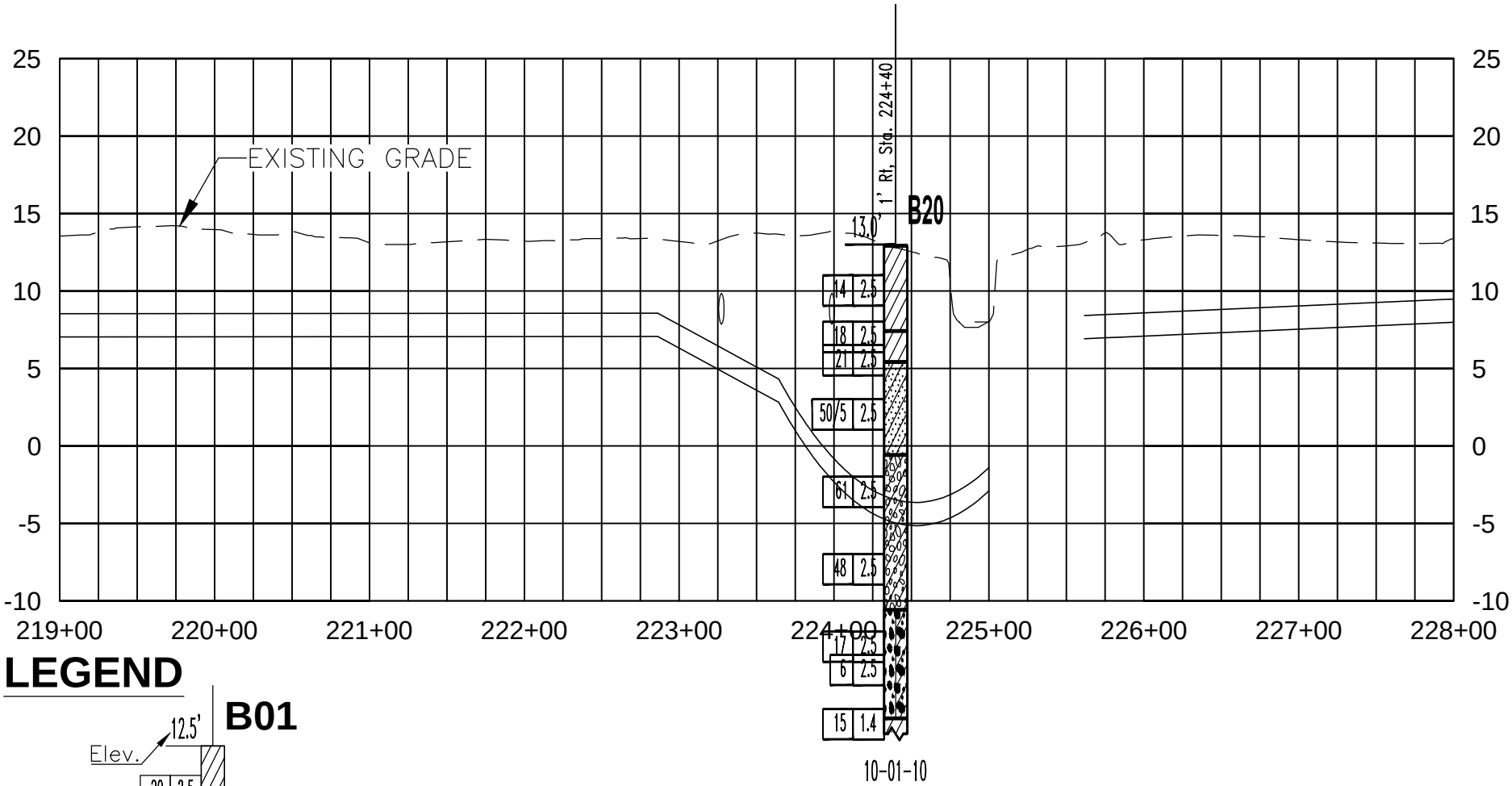
PROFILE AT STA 157+50

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C



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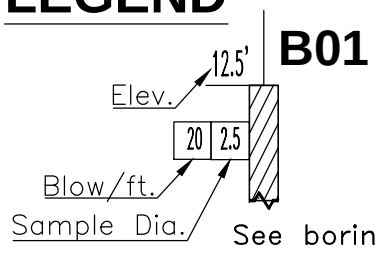

See boring logs for material description.

SCALE:
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1"=10' vert.

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PROFILE AT STA 225+00

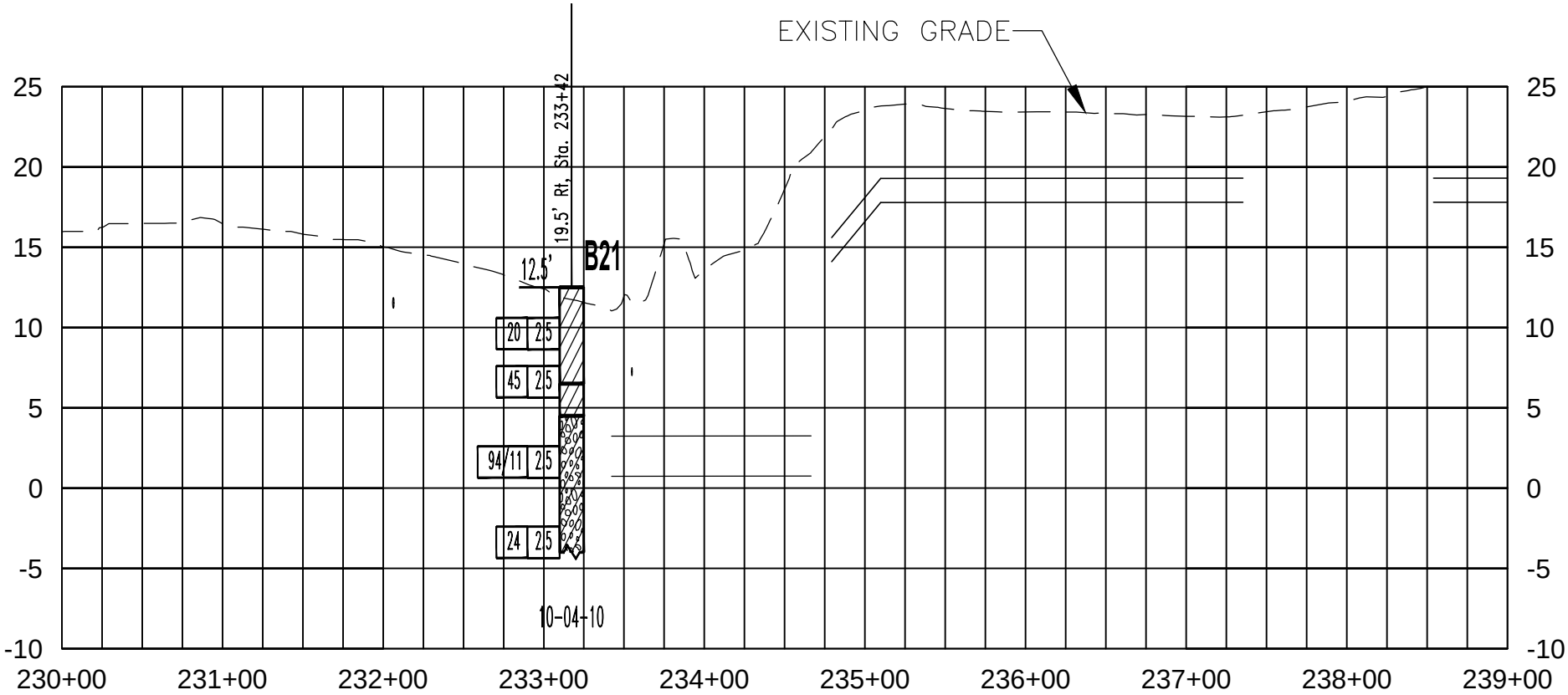
Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C

4/26/2011 2049.1 Appendix C Profile Plans.dwg



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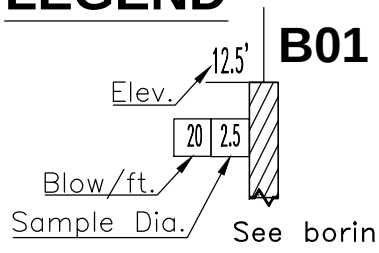

See boring logs for material description.

SCALE:
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1"=10' vert.

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PROFILE AT STA 234+00

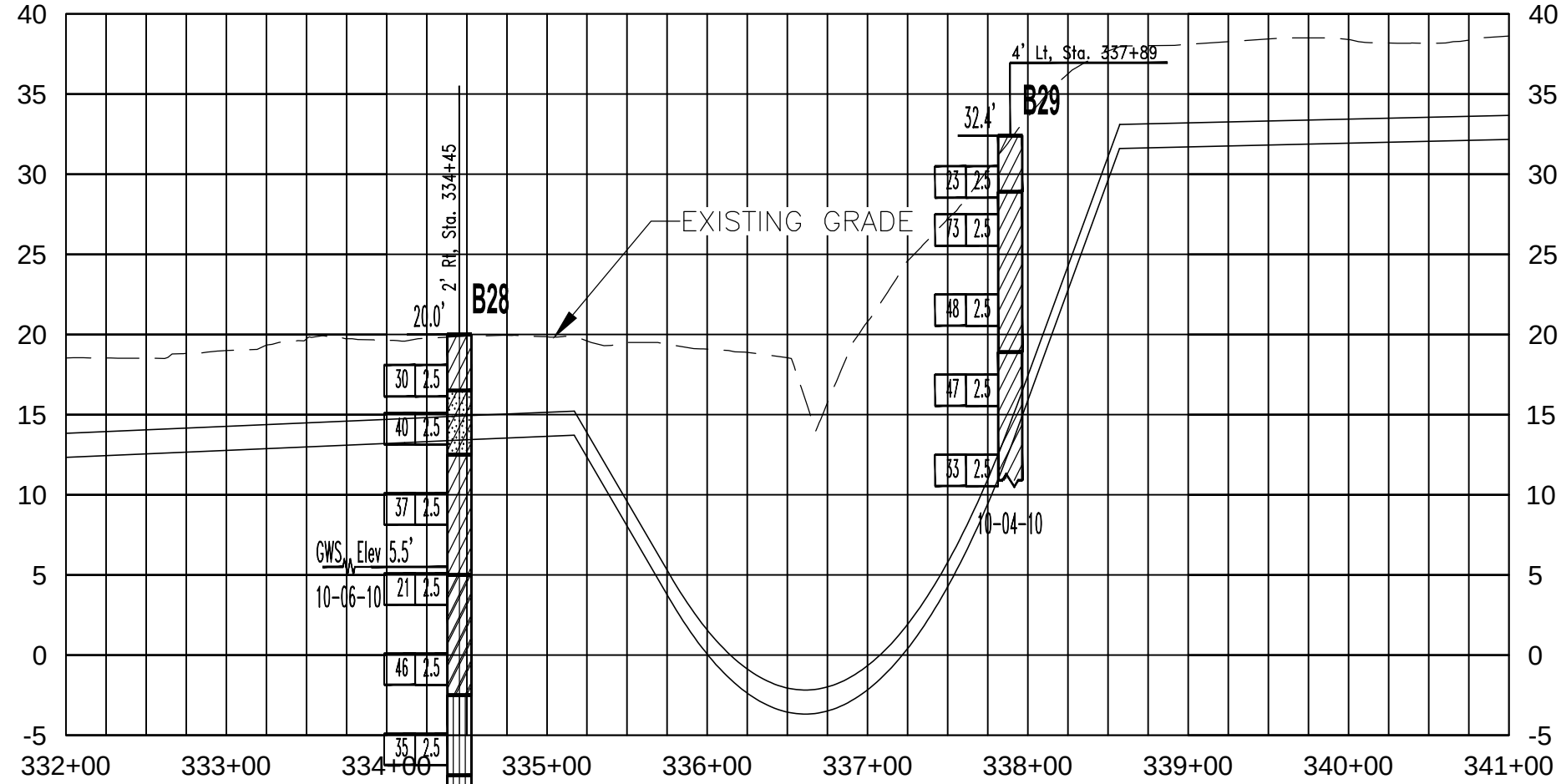
Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C

4/26/2011 2049.1 Appendix C Profile Plans.dwg



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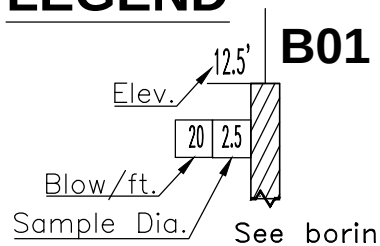

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PROFILE AT STA 336+00

Napa-Sonoma Salt Marsh
Restoration Pipeline
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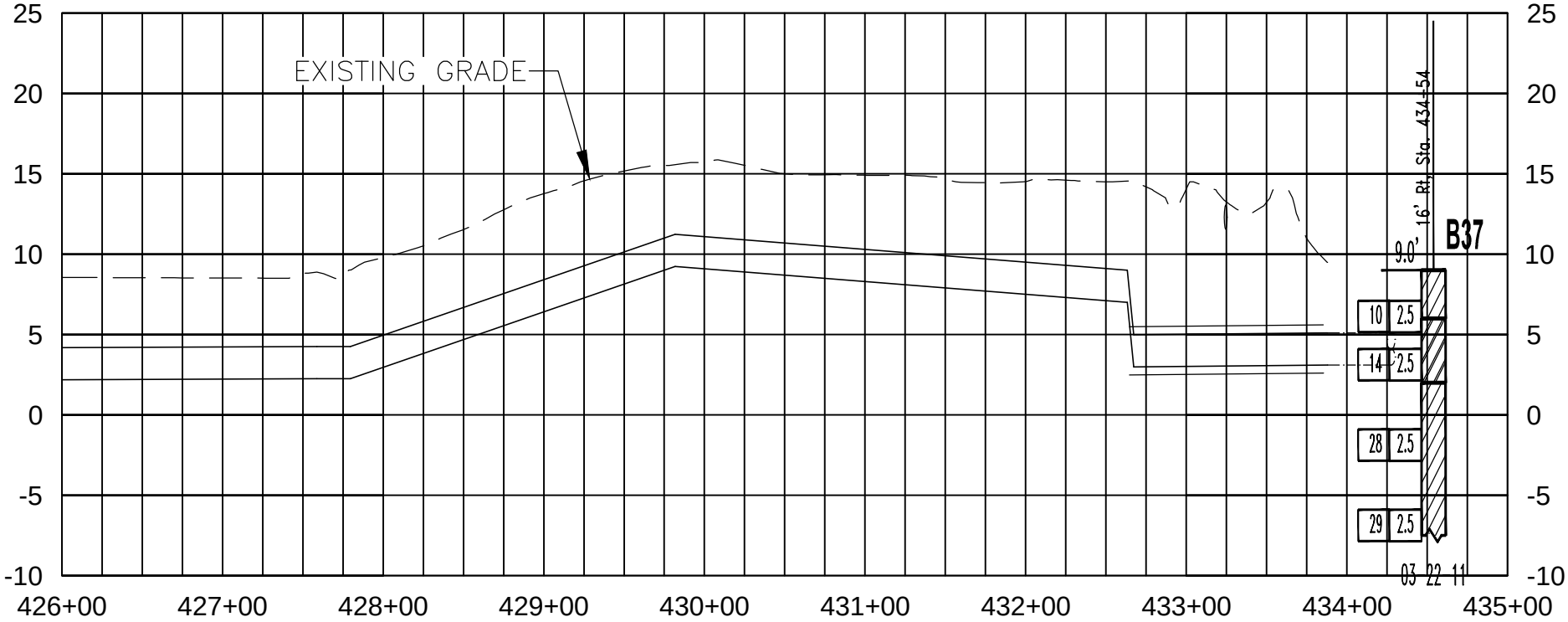
File No. 2049.1

April 2011

Appendix C



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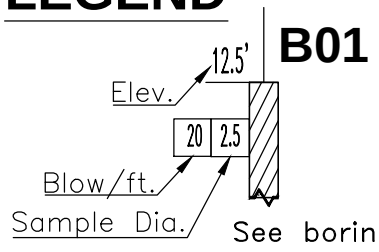

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PROFILE AT STA 433+00

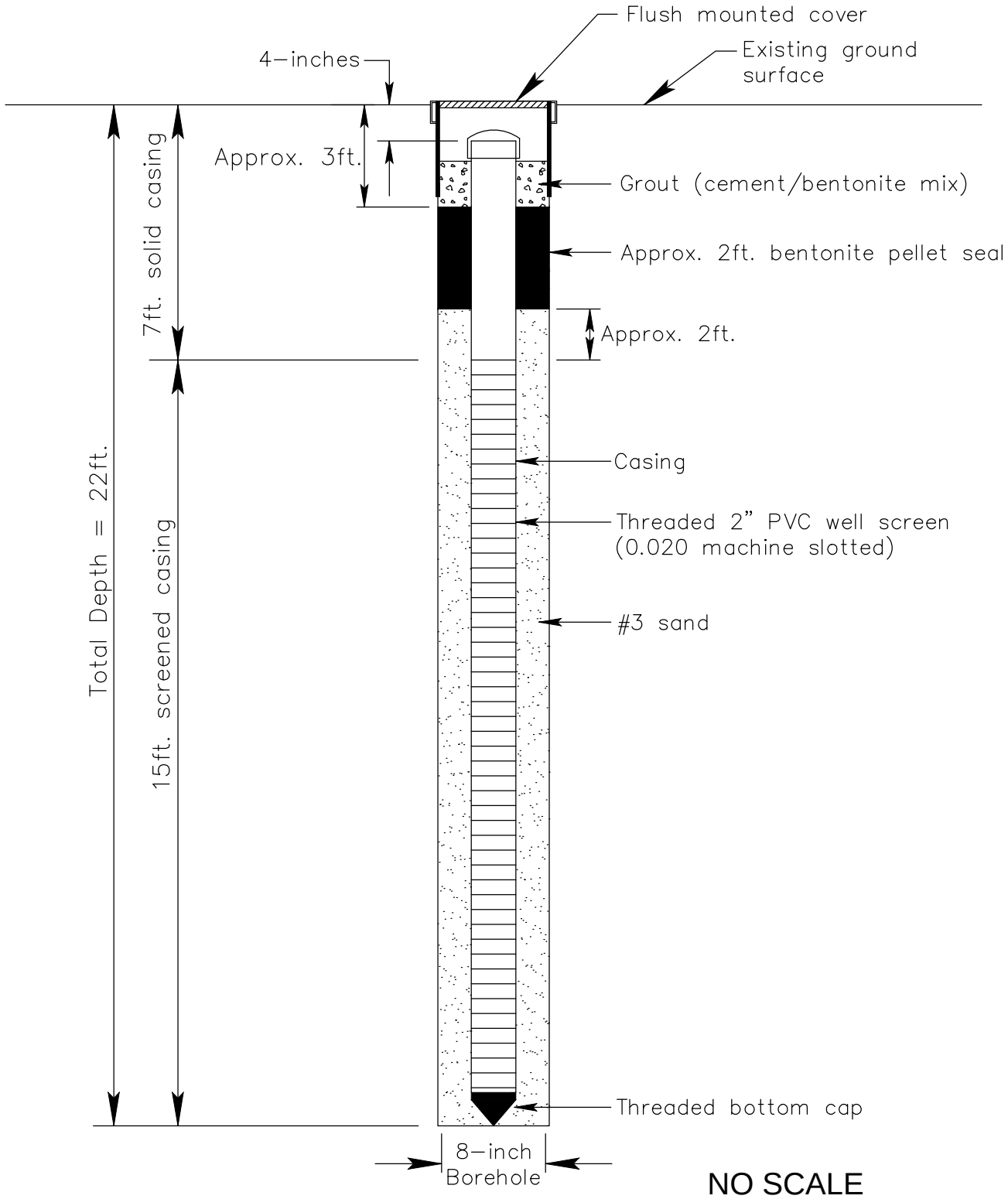
Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

Appendix C

4/26/2011 2049.1 Appendix C Profile Plans.dwg



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WELL B05 DETAIL

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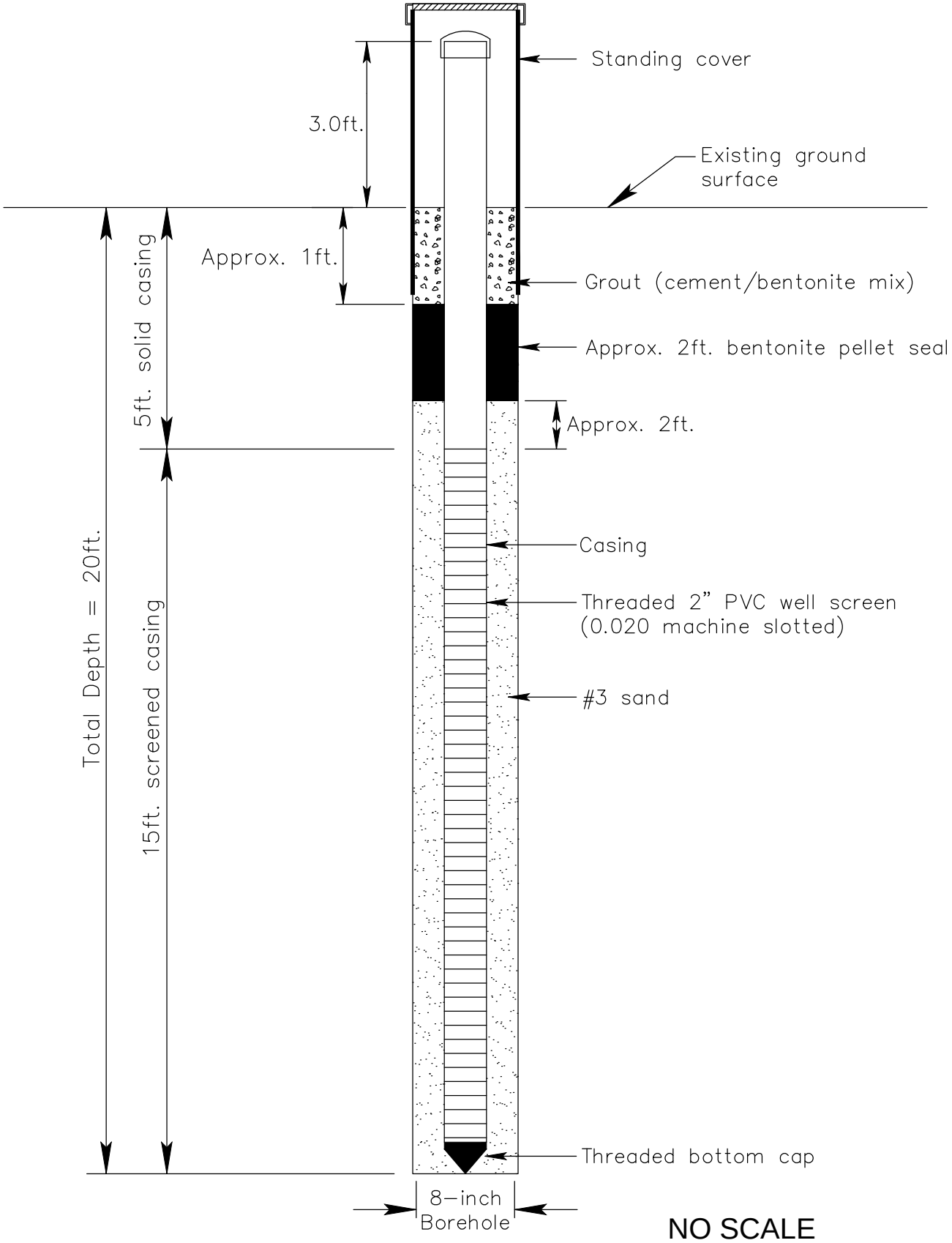
File No. 2049.1

April 2011

4/25/2011 2049.1 MW Schematic.dwg



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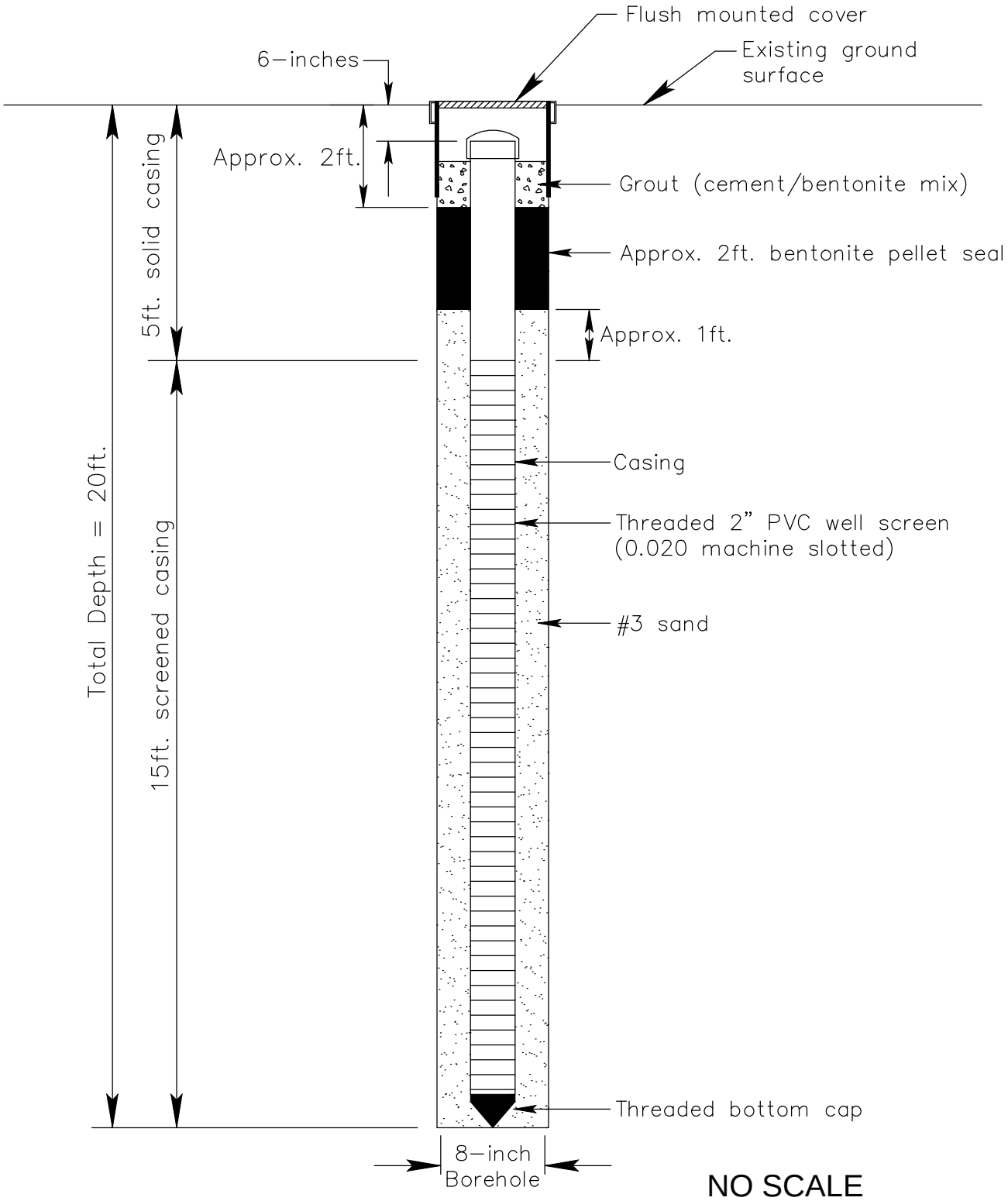
WELL B21 DETAIL

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

4/25/2011 2049.1 MW Schematic.dwg



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WELL B28 DETAIL

Napa-Sonoma Salt Marsh
Restoration Pipeline
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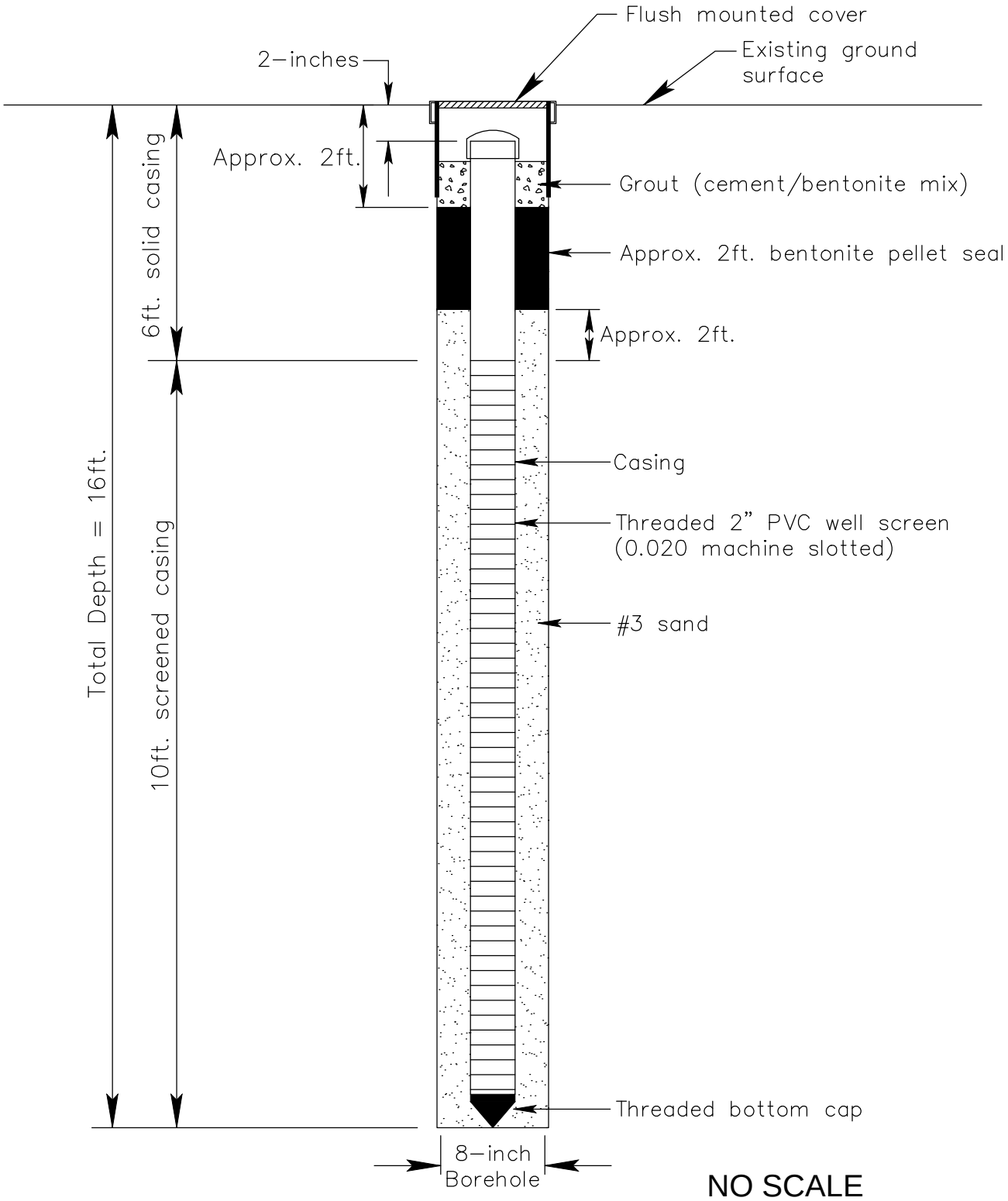
File No. 2049.1

April 2011

4/25/2011 2049.1 MW Schematic.dwg



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WELL B36 DETAIL

Napa-Sonoma Salt Marsh
Restoration Pipeline
Napa and Sonoma Counties, California

File No. 2049.1

April 2011

4/25/2011 2049.1 MW Schematic.dwg

APPENDIX D

Field and Laboratory Testing Summary (Sheets 1-5)

Laboratory Test Results

Field and Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	N Value	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Pocket Penetrom. (tsf)	Unconf. Compression (tsf)	D1557 Max Dry Density, (pcf)/Opt. Moist (%)	Corrosivity			
																	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
B1	1	1.5-3.0	Bulk	CL																
B1	2	2.0-3.5	2.5 ID SS	CL	6	24.7	92							0.5						
B1	3	5.0-6.5	2.5 ID SS	CL	42	39.2	79							>4.5						
B1	4	10-11.5	2.5 ID SS	CL	47	24.3	100							>4.5	1.4					
B1	5	15.0-16.5	2.5 ID SS	CL	10									2.5						
B1	6	16.5-18.0	SPT	SM	34			13.0	15.9											
B1	7	20.0-21.5	2.5 ID SS	SW-SM	43	15	118	29.4	7.9					>4.5						
B1	8	25.0-26.5	2.5 ID SS	CL/SM	41	31.8	94							>4.5						
B1	9	30.0-31.5	2.5 ID SS	SM/CL	32	22.1	108	19.6	13.8					>4.5						
B1	10	35.0-36.5	2.5 ID SS	CL	16	20.5	108			38	18			1.8						
B1	11	36.5-38.0	SPT	CL/GP-GC	28															
B2	1	2.0-3.5	2.5 ID SS	SW	44															
B2	2	5.0-6.5	2.5 ID SS	CL	17	27.6	91							2.2	1.5					
B2	3	10-11.5	2.5 ID SS	CL	19									4.0			7.6	1170	21.0	10.0
B2	4	15.0-16.5	2.5 ID SS	GP-GC	57				6.6											
B4	1	2.0-3.5	2.5 ID SS	CL	29	14.1	106							>4.5						
B4	2	5.0-5.5	2.5 ID SS	SP-SM/ML	50/6	19.2	102							>4.5						
B4	3	10-11.5	2.5 ID SS	SC	16	33.1	90					27	543				8.1	1860	26.0	7.4
B4	4	15.0-16.5	2.5 ID SS	SC	14									0.8						
B5	1	1.5-3.0	Bulk	CL																
B5	2	2.0-3.5	2.5 ID SS	CL/ML	11	16.9	94							2.0						
B5	3	5.0-6.5	2.5 ID SS	CL	10	28.7	92							>4.5			6.4	1070	53.0	11.0
B5	4	10-11.5	2.5 ID SS	ML	31	26.9	94					32	400	3.5						
B5	5	15.0-16.5	2.5 ID SS	SC	11	30.9	92							2.0						
B5	6	20.0-21.5	2.5 ID SS	GW-GC	37	23.3	104	45.0	8.0											
B6	1	2.0-3.5	2.5 ID SS	GP-GC	57	10.6	111							>4.5						
B6	2	5.0-6.5	2.5 ID SS	CL	33	14.1	110							1.5						
B6	3	10-11.5	2.5 ID SS	ML	49									>4.5						
B6	4	15.0-16.5	2.5 ID SS	CL	20									1.5						
B7	1	1.5-4.5	Bulk	CL/CH						41	25									
B7	2	2.0-3.5	2.5 ID SS	CL/CH	11	22.4	89							3.7						
B7	3	5.0-6.5	2.5 ID SS	CL	23	22.5	104							>4.5						
B7	4	10.0-11.5	2.5 ID SS	SW-SC	38												7.4	260	1700.0	310.0
B7	5	15.0-16.5	2.5 ID SS	CL	71	28.4	96							>4.5	4.4					
B7	6	20.0-21.5	2.5 ID SS	CL	20	33.1	91							3.2						
B7	7	25.0-26.5	2.5 ID SS	SC	31															
B7	8	30.0-31.5	2.5 ID SS	CL	28									4.0						
B7	9	35.0-36.5	2.5 ID SS	CH	23									3.2						
B7	10	40.0-41.5	2.5 ID SS	CH	19									2.5						
B7	11	45.0-46.5	2.5 ID SS	CH	34									1.7						
B7	12	50.0-51.5	2.5 ID SS	CH	54									>4.5						
B8	1	2.0-3.5	2.5 ID SS	CL/CH	8	16.3	113							1.8	1.2					
B8	2	5.0-6.5	2.5 ID SS	CL/CH	12															

Field and Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	N Value	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Pocket Penetrom. (tsf)	Unconf. Compression (tsf)	D1557 Max Dry Density, (pcf)/Opt. Moist (%)	Corrosivity			
																	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
B8	3	10.0-11.5	2.5 ID SS	SM	46				33.7											
B8	4	15.0-16.5	2.5 ID SS	GP/CL	24	28.9	95							>4.5						
B8	5	20.0-21.5	2.5 ID SS	CL	23	32.6	89							2.3	1.1					
B8	6	25.0-26.5	2.5 ID SS	CL	36									>4.5						
B8	7	30.0-31.5	2.5 ID SS	CL	22				53.8	38	17									
B8	8	35.0-36.5	2.5 ID SS	SP-SM	26				10.7											
B8	9	40.0-41.5	2.5 ID SS	SC	36															
B8	10	45.0-46.5	2.5 ID SS	CL	60									>4.5						
B8	11	50.0-51.5	2.5 ID SS	CL	56									>4.5						
B9	1	2.0-3.5	2.5 ID SS	SC	23	16.7	96							>4.5						
B9	2	5.0-6.5	2.5 ID SS	SC	36	16.2	112							>4.5						
B9	3	10.0-11.5	2.5 ID SS	CL/CH	22	27.8	94							2.5						
B9	4	15.0-16.5	2.5 ID SS	CL/CH	24									2.5						
B9	5	20.0-21.5	2.5 ID SS	CL	35									>4.5						
B9	6	25.0-26.5	2.5 ID SS	ML	45									>4.5						
B10	1	1.0-3.0	Bulk	SC																
B10	2	2.0-3.25	2.5 ID SS	SC	71/9	14	114							>4.5						
B10	3	5.0-6.5	2.5 ID SS	SP-SM	49	20.1	104							>4.5						
B10	4	10.0-11.5	2.5 ID SS	CL	40	27.8	95							>4.5						
B10	5	15.0-16.5	2.5 ID SS	SP-SM	10															
B10	6	20.0-21.5	2.5 ID SS	SW-SM	52															
B11	1	2.0-3.5	2.5 ID SS	SM	14	8.9	105							3.5						
B11	2	5.0-6.5	2.5 ID SS	CL	25									>4.5			7.6	1170	27	12
B11	3	10.0-11.5	2.5 ID SS	CL	79	11.7	122							>4.5						
B12	1	1.5-4.5	Bulk	CL & ML																
B12	2	2.0-3.5	2.5 ID SS	CL	25	14.4	115							>4.5						
B12	3	5.0-6.5	2.5 ID SS	ML	39	28.3	95							>4.5						
B12	4	10.0-11.5	2.5 ID SS	SM	27	26.3	98							>4.5						
B12	5	15.0-16.5	2.5 ID SS	SP-SM	7															
B13	1	2.0-3.5	2.5 ID SS	ML & CL	18	16.1	98							2.3						
B13	2	5.0-6.5	2.5 ID SS	CL	35					33	22			>4.5						
B13	3	10.0-11.5	2.5 ID SS	ML	17									2.0						
B14	1	1.5-4.5	Bulk	ML & CL																
B14	2	2.0-3.5	2.5 ID SS	ML	70									>4.5						
B14	3	5.0-6.5	2.5 ID SS	CL	44									>4.5						
B14	4	10.0-11.5	2.5 ID SS	CL	35									>4.5						
B15	1	2.0-3.5	2.5 ID SS	CL	18	16.2	99			43	27			>4.5						
B15	2	5.0-6.5	2.5 ID SS	ML	12									2.0						
B15	3	10.0-11.5	2.5 ID SS	GP	35									3.0						
B16	1	2.0-3.5	2.5 ID SS	CL	18	8.5	92							>4.5	0.0					
B16	2	5.0-6.5	2.5 ID SS	GC	41									>4.5						
B16	3	10.0-11.5	2.5 ID SS	ML	21	16.7	113							3.8						
B16	4	15.0-16.5	2.5 ID SS	ML	24									3.5						

Field and Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	N Value	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Pocket Penetrom. (tsf)	Unconf. Compression (tsf)	D1557 Max Dry Density, (pcf)/Opt. Moist (%)	Corrosivity			
																	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
B16	5	20.0-21.5	2.5 ID SS	ML	27									4.5						
B17	1	1.5-3.0	Bulk	CL																
B17	2	2.0-3.5	2.5 ID SS	CL	33	10	116							>4.5						
B17	3	5.0-6.5	2.5 ID SS	CL	18									2.0			8.6	1040	110	92
B17	4	10.0-11.5	2.5 ID SS	CL	27	20.7	107							>4.5						
B17	5	15.0-16.5	2.5 ID SS	SC	60															
B17	6	20.0-21.5	2.5 ID SS	CL	23									3.8						
B17	7	25.0-26.5	2.5 ID SS	CL	43									>4.5						
B18	1	2.0-3.5	2.5 ID SS	CL	22	7.7	100							4.5						
B18	2	5.0-6.5	2.5 ID SS	CL	30	22.5	99							3.8	2.2					
B18	3	10.0-11.5	2.5 ID SS	CL	19									3.8						
B18	4	15.0-16.5	2.5 ID SS	CL	16									2.5						
B18	5	20.0-21.5	2.5 ID SS	CL	85/11									>4.5						
B19	1	1.5-3.0	Bulk	CL																
B19	2	2.0-3.5	2.5 ID SS	CL	11	23.6	100							1.8						
B19	3	5.0-6.5	2.5 ID SS	SC	11	16.1	109							3.0						
B19	4	10.0-11.5	2.5 ID SS	GC	85/11															
B19	5	15.0-16.5	2.5 ID SS	GC	50/6															
B20	1	2.0-3.5	2.5 ID SS	CL	14	13.7	91			25	8			>4.5						
B20	2	5.0-6.5	2.5 ID SS	CL	18															
B20	3	6.5-8.0	2.5 ID SS	CL/SC	21	16.6	114							2.8						
B20	4	10.0-11.5	2.5 ID SS	SC	50/5															
B20	5	15.0-16.5	2.5 ID SS	GC	61															
B20	6	20.0-21.5	2.5 ID SS	GC	48															
B20	7	25.0-26.5	2.5 ID SS	GW-GC	17															
B20	8	26.5-28.0	2.5 ID SS	GW-GC	6															
B20	9	30.0-31.5	SPT	CL	15															
B21	1	1.5-4.5	Bulk	CL													5.6	820	110	49
B21	2	2.0-3.5	2.5 ID SS	CL	20	18.7	108							>4.5						
B21	3	5.0-6.5	2.5 ID SS	CL	45	25.5	92							3.0						
B21	4	10.0-11.5	2.5 ID SS	GC	94/11															
B21	5	15.0-16.5	2.5 ID SS	GC	24															
B22	1	2.0-3.5	2.5 ID SS	CL	30									>4.5						
B22	2	5.0-6.5	2.5 ID SS	CL	51	19.2	96							>4.5	3.6					
B22	3	10.0-11.5	2.5 ID SS	GC	61				12.1					>4.5						
B23	1	1.5-4.5	Bulk	CL																
B23	2	2.0-3.5	2.5 ID SS	CL	20	17.2	92							>4.5						
B23	3	5.0-6.5	2.5 ID SS	ML	16	15.7	96							3.6						
B23	4	10.0-11.5	2.5 ID SS	CL	19	12.3	93							4.2						
B23	5	15.0-16.5	2.5 ID SS	CL	22	25.7	95							2.6						
B24	1	2.0-3.5	2.5 ID SS	ML	19									3.2						
B24	2	5.0-6.5	2.5 ID SS	CL	54			0.0	97.6	45	20			>4.5						
B24	3	10.0-11.5	2.5 ID SS	SM	45			13.6	26.0					>4.5						

Field and Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	N Value	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Pocket Penetrom. (tsf)	Unconf. Compression (tsf)	D1557 Max Dry Density, (pcf)/Opt. Moist (%)	Corrosivity			
																	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
B25	1	1.5-4.5	Bulk	CL&ML																
B25	2	2.0-3.5	2.5 ID SS	CL&ML	41	22.4	102							>4.5						
B25	3	5.0-6.5	2.5 ID SS	ML	45	26.9	97							>4.5						
B25	4	10.0-11.5	2.5 ID SS	ML	28	26.1	93							>4.5						
B25	5	15.0-16.5	2.5 ID SS	ML	33	22.7	106							>4.5						
B26	1	2.0-3.5	2.5 ID SS	CH	17			0.0	87.9	63	42			>4.5						
B26	2	5.0-6.5	2.5 ID SS	ML	38			0.0	98.2	40	11			2.5						
B26	3	10.0-11.5	2.5 ID SS	ML	30	23.7	99							>4.5	2.3					
B27	1	1.5-4.5	Bulk	CL/ML																
B27	2	2.0-3.5	2.5 ID SS	CL/ML	33	20.7	100							2.6						
B27	3	5.0-6.5	2.5 ID SS	CL	50	18.1	108							>4.5						
B27	4	10.0-11.5	2.5 ID SS	CL	53	19.6	105							>4.5						
B27	5	15.0-16.5	2.5 ID SS	ML	35	19.2	103							1.5						
B28	1	2.0-3.5	2.5 ID SS	CL	30									2.5						
B28	2	5.0-6.5	2.5 ID SS	SC	40	12.3	103		15.5											
B28	3	10.0-11.5	2.5 ID SS	CL	37	23.8	100							>4.5	3.0					
B28	4	15.0-16.5	2.5 ID SS	CH	21	27.3	94			53	31			>4.5						
B28	5	20.0-21.5	2.5 ID SS	CL	46									>4.5						
B28	6	25.0-26.5	2.5 ID SS	ML	35									>4.5						
B28	7	30.0-31.5	2.5 ID SS	ML	49									>4.5						
B28	8	35.0-36.5	2.5 ID SS	ML	27									>4.5						
B28	9	40.0-41.5	2.5 ID SS	ML	41									4.5						
B28	10	45.0-46.5	2.5 ID SS	SW-SC	54															
B28	11	50.0-51.5	2.5 ID SS	GP	43															
B29	1	2.0-3.5	2.5 ID SS	CL	23	20.7	98							3.0						
B29	2	5.0-6.5	2.5 ID SS	CL	73									>4.5			6.2	500	270	17
B29	3	10.0-11.5	2.5 ID SS	CL	48	18.7	103			48	26			>4.5	2.5					
B29	4	15.0-16.5	2.5 ID SS	CL	47	24.6	100							>4.5						
B29	5	20.0-21.5	2.5 ID SS	CL	33															
B30	1	2.0-3.5	2.5 ID SS	CL	14	23.9	94							2.0						
B30	2	5.0-6.5	2.5 ID SS	GP-GC	50/6															
B30	3	10.0-11.5	2.5 ID SS	GP-GC	49	14.9	113							>4.5						
B31	1	1.5-4.5	Bulk	CL																
B31	2	2.0-3.5	2.5 ID SS	CL	14															
B31	3	5.0-6.5	2.5 ID SS	ML	35									>4.5						
B31	4	10.0-11.5	2.5 ID SS	ML	78									>4.5						
B31	5	15.0-16.5	2.5 ID SS	SC	49															
B32	1	2.0-3.5	2.5 ID SS	CL-ML	12			8.2	63.8	24	7			3.2						
B32	2	5.0-6.5	2.5 ID SS	CL-ML	40	22.5	100		84.6					>4.5	1.4					
B32	3	10.0-11.5	MC	CL-ML	32			0.0	96.8					>4.5						
B33	1	1.5-4.5	Bulk	CL & SC																
B33	2	2.0-3.5	2.5 ID SS	CL	17	13.4	116							>4.5						
B33	3	5.0-6.5	2.5 ID SS	SC	16	17	106													

Field and Laboratory Testing Summary

Exploration I.D.	Sample No.	Depth (feet)	Sample Type	USCS Classification	N Value	Moisture Content (%)	Dry Density, γ_{dry} (pcf)	Percent Retained #4	Percent Passing #200	LL	P I	Friction Angle, ϕ	Cohesion, psf, C	Pocket Penetrom. (tsf)	Unconf. Compression (tsf)	D1557 Max Dry Density, (pcf)/Opt. Moist (%)	Corrosivity			
																	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)
B33	4	10.0-11.5	2.5 ID SS	CL	40	19.5	109													
B33	5	15.0-16.5	2.5 ID SS	CL	35									>4.5						
B34	1	2.0-3.5	2.5 ID SS	CL	15	13.7	108			40	27			4.5						
B34	2	5.0-6.5	2.5 ID SS	CL & ML	14									1.3			5.3	1170	30	30
B34	3	10.0-11.5	2.5 ID SS	CL	25	26	95							3.8						
B35	1	1.5-4.5	Bulk	CL																
B35	2	2.0-3.5	2.5 ID SS	CL	9	16.9	106							1.5						
B35	3	5.0-6.5	2.5 ID SS	CL	26	15.3	110							3.5	1.4					
B35	4	10.0-11.5	2.5 ID SS	ML	54	24.6	101							>4.5						
B35	5	15.0-16.5	2.5 ID SS	ML	47									>4.5						
B36	1	1.0-2.0	Bulk	CL																
B36	2	2.0-3.5	2.5 ID SS	SC	12	23.4	93							2.0						
B36	3	5.0-6.5	2.5 ID SS	SC	42	18.7	106	21.0	33.7					>4.5						
B36	4	10.0-11.5	2.5 ID SS	CL/CH	28	27.5	97			59	36			3.0						
B36	5	15.0-16.5	2.5 ID SS	CL/CH	13									1.5						
B36	6	16.5-18.0	SPT	CL/CH	9									1.5						
B37	1	1.0-5.0	Bulk	CL & CH													7.4	674		
B37	2	2.0-3.5	2.5 ID SS	CL & CH	10	25.6	98							0.7						
B37	3	5.0-6.5	2.5 ID SS	CH	14	32.2	88			66	46			1.0	1.2					
B37	4	10.0-11.5	2.5 ID SS	CL	28	22.5	103							>4.5	2.9					
B37	5	15.0-16.5	2.5 ID SS	CL	29	27.1	102							>4.5						
B1&B5	1	1.5-3.0	Bulk	CL & SC				14.1	49.6	29	10					121.7/11.0				
B12&B14	1	1.5-4.5	Bulk	CL & ML						35	21					120.2/11.7				
B25&B27	1	1.5-4.5	Bulk	CL & ML				4.0								115.5/13.3				
B31&B35	1	1.5-4.5	Bulk	CL				10.4	63.5	42	25					120.5/12.4				

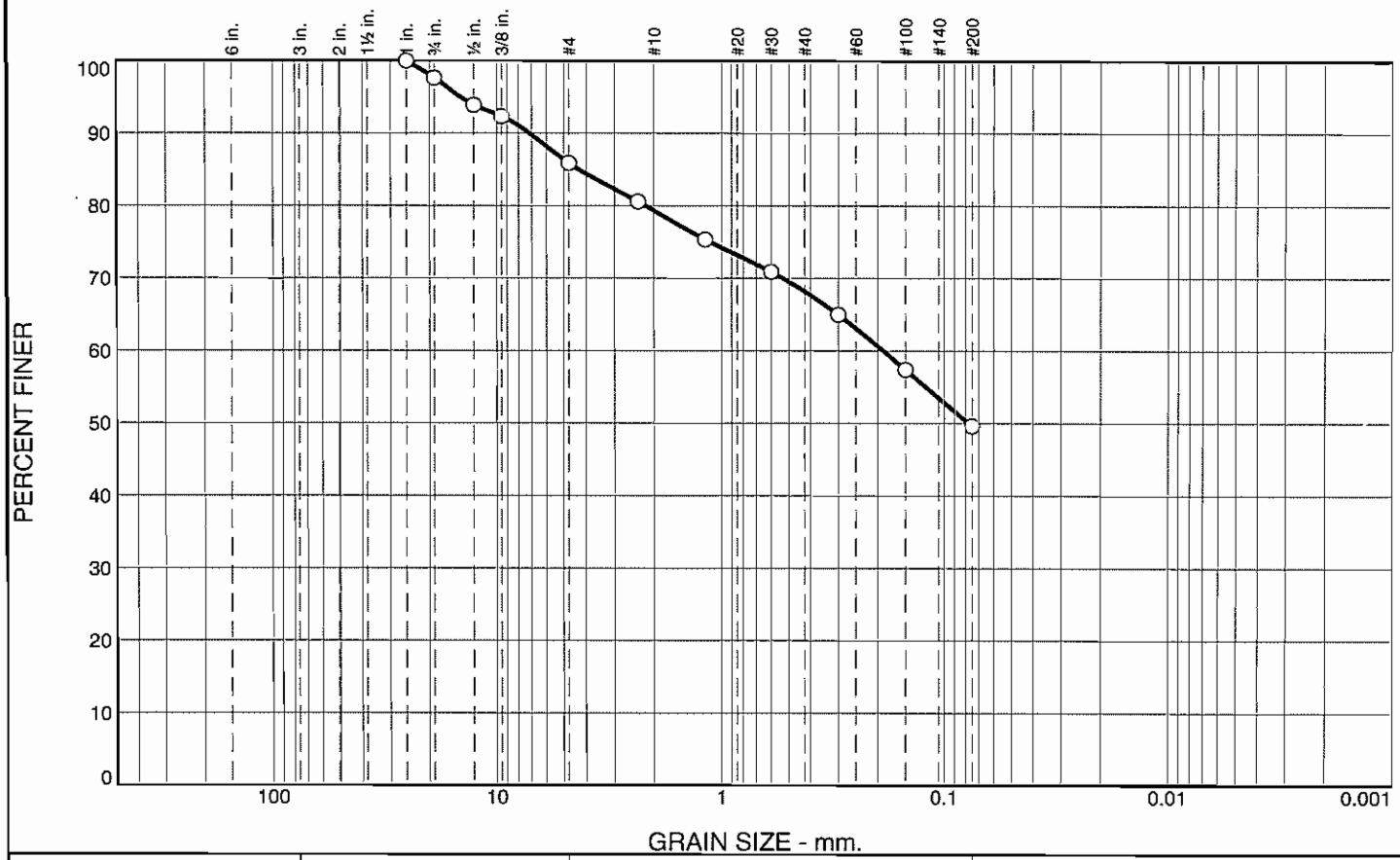
Project: Napa-Sonoma Pipeline
Project No.: 2049.1
Date: November 2010

blackburn consulting

Test Results - #200 Sieve Wash (ASTM D1140)

Sample No.	Approximate Depth (ft)	Percent Passing #200 Sieve	Material Description
B2-4B	15.5-16.0	6.6	Poorly Graded Gravel with Clay and Sand
B8-3C	11.0-11.5	33.7	Silty Sand with Gravel
B8-7C	31.0-31.5	53.8	Sandy lean Clay
B8-8C	36.0-36.5	10.7	Poorly Graded Sand with Silt
B22-3B	10.5-11.0	12.1	Clayey Gravel
B28-2C	6.0-6.5	15.5	Clayey Sand with Gravel
B32-2C	6.0-6.5	84.6	Silty Clay with Sand

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.4	11.7	6.6	11.1	18.6	49.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
3/4"	97.6		
1/2"	93.9		
3/8"	92.4		
#4	85.9		
#8	80.6		
#16	75.3		
#30	70.9		
#50	65.0		
#100	57.4		
#200	49.6		

* (no specification provided)

Material Description

Dark Brown Clayey SAND

Atterberg Limits

PL= 19 LL= 29 PI= 10

Coefficients

D_{90}= 7.1367 D_{85}= 4.3006 D_{60}= 0.1882
D_{50}= 0.0775 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(2)

Remarks

Sample Number: B1-1 & B5-1 Combined **Depth:** 1.5'-3.0'

Date: 11-17-2010

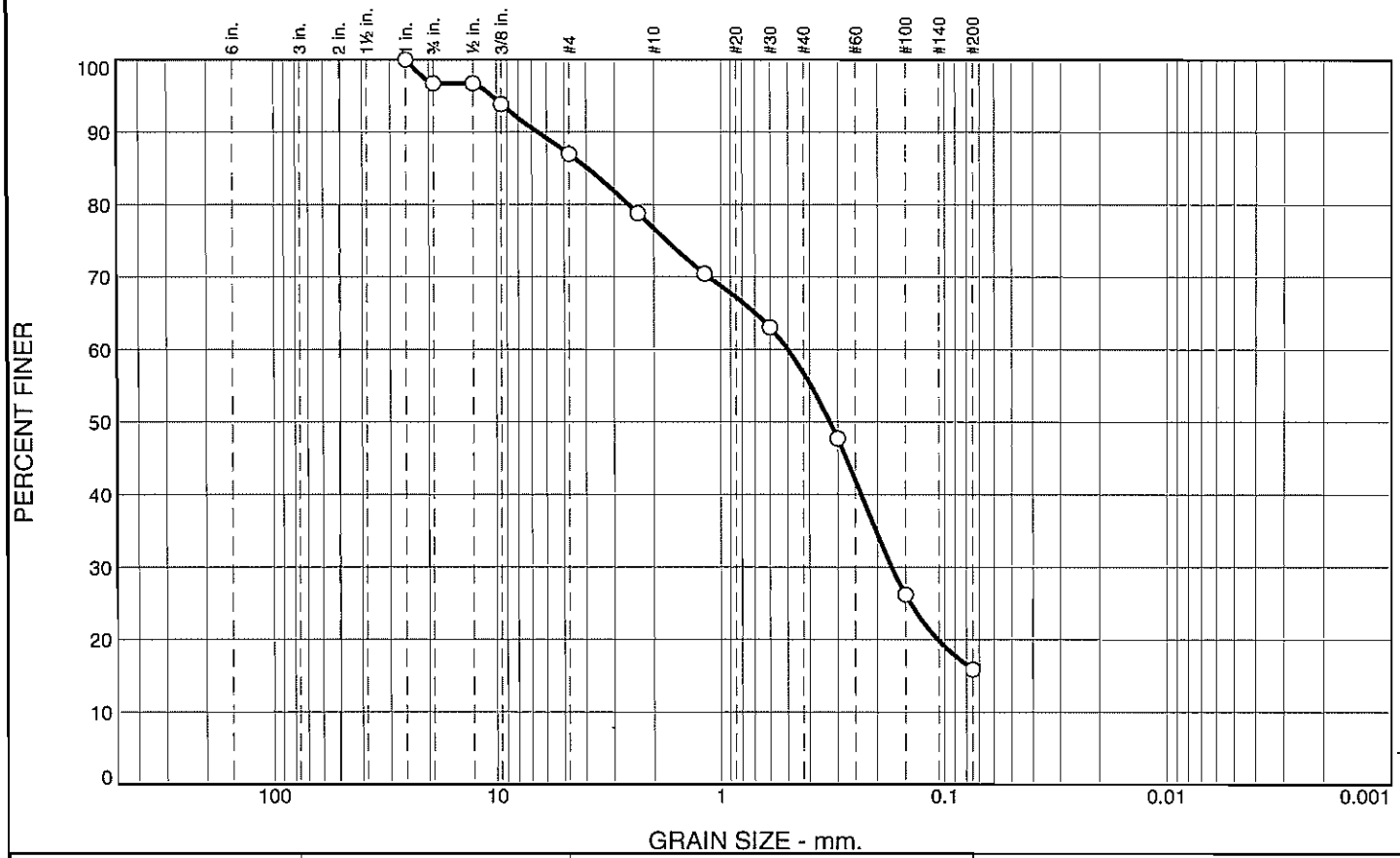
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	9.7	10.3	19.9	40.9	15.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	96.7		
1/2"	96.7		
3/8"	93.8		
#4	87.0		
#8	78.8		
#16	70.4		
#30	63.0		
#50	47.7		
#100	26.2		
#200	15.9		

* (no specification provided)

Material Description

Brown Silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 6.5707 D_{85}= 3.9434 D_{60}= 0.4991
D_{50}= 0.3244 D_{30}= 0.1727 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: B1-6 **Depth:** 16.5'-18.0'

Date: 11-11-2010

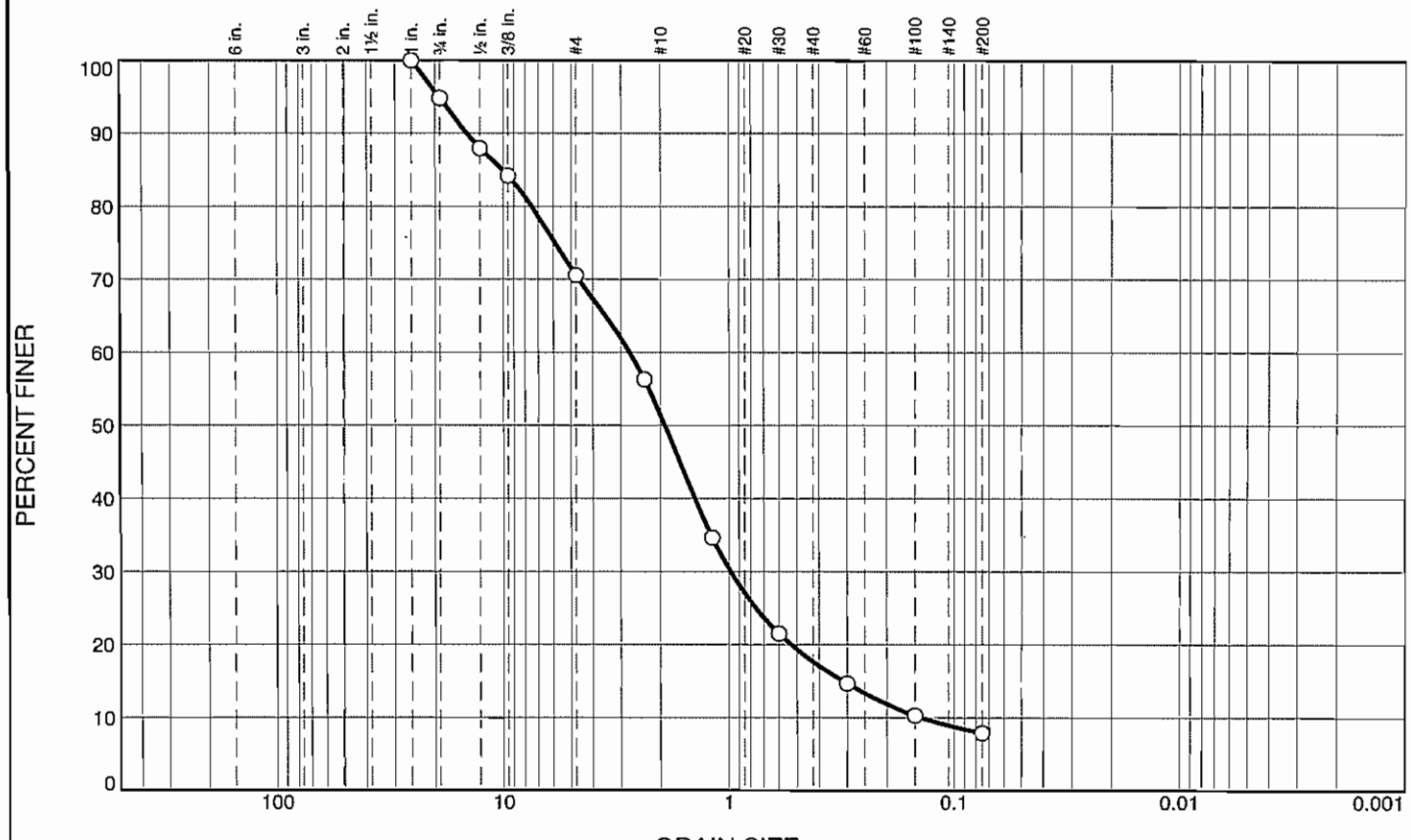
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.2	24.2	19.2	33.8	9.7	7.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
3/4"	94.8		
1/2"	88.0		
3/8"	84.2		
#4	70.6		
#8	56.3		
#16	34.6		
#30	21.5		
#50	14.7		
#100	10.3		
#200	7.9		

* (no specification provided)

Material Description

Olive brown well graded SAND with Silt and Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 14.5068 D_{85}= 10.0769 D_{60}= 2.7456
D_{50}= 1.9119 D_{30}= 0.9825 D_{15}= 0.3126
D_{10}= 0.1411 C_u= 19.46 C_c= 2.49

Classification

USCS= SW-SM AASHTO=

Remarks

Sample Number: B1-7C **Depth:** 21.0'-21.5'

Date: 4-7-2010

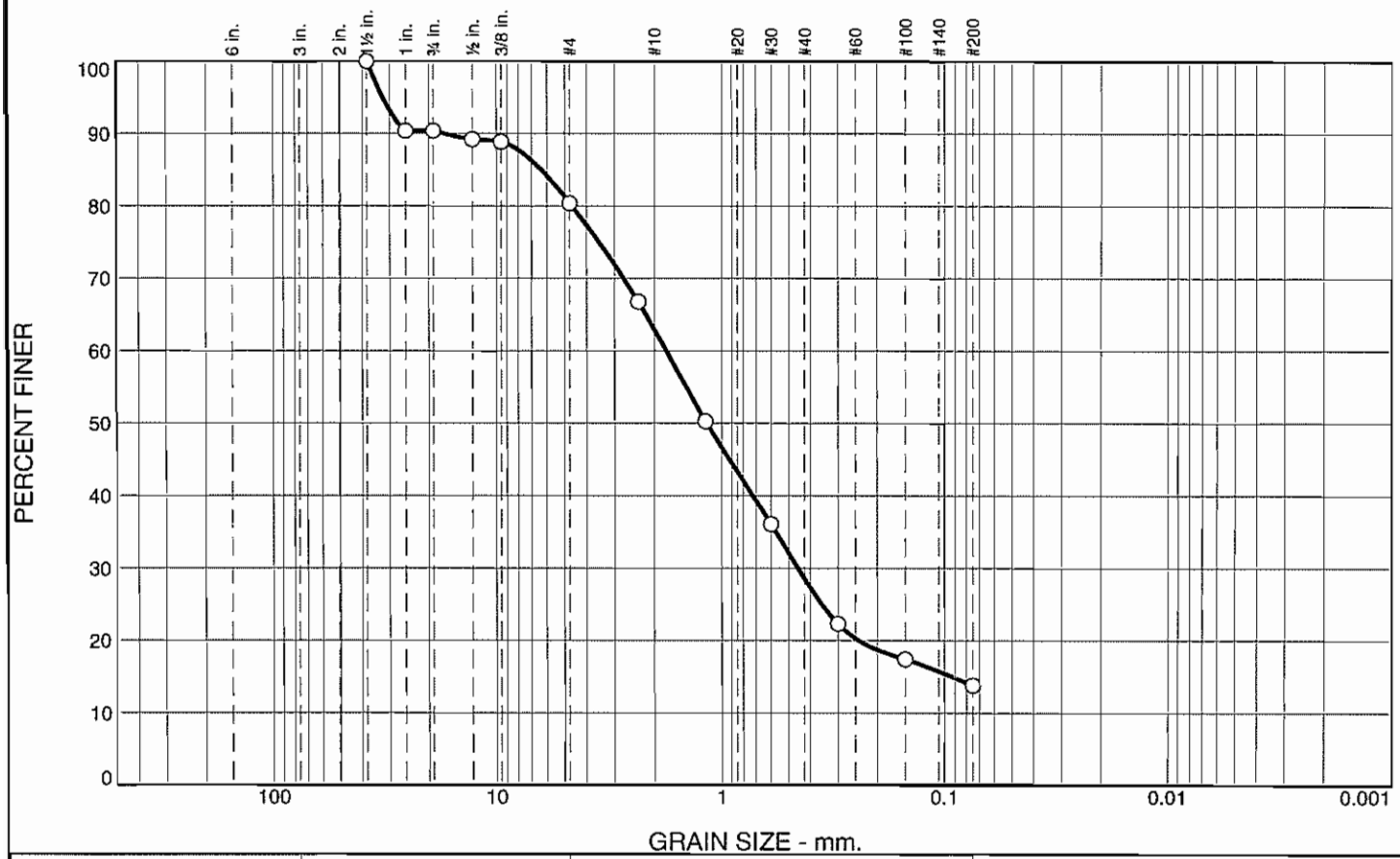
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.6	10.0	17.5	34.3	14.8	13.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	90.4		
3/4"	90.4		
1/2"	89.2		
3/8"	88.9		
#4	80.4		
#8	66.8		
#16	50.3		
#30	36.1		
#50	22.3		
#100	17.4		
#200	13.8		

* (no speeification provided)

Material Description

Brown Silty SAND with Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 17.1942 D_{85}= 6.3281 D_{60}= 1.7720
D_{50}= 1.1651 D_{30}= 0.4548 D_{15}= 0.0927
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: B1-9B **Depth:** 30.5'-31.0'

Date:

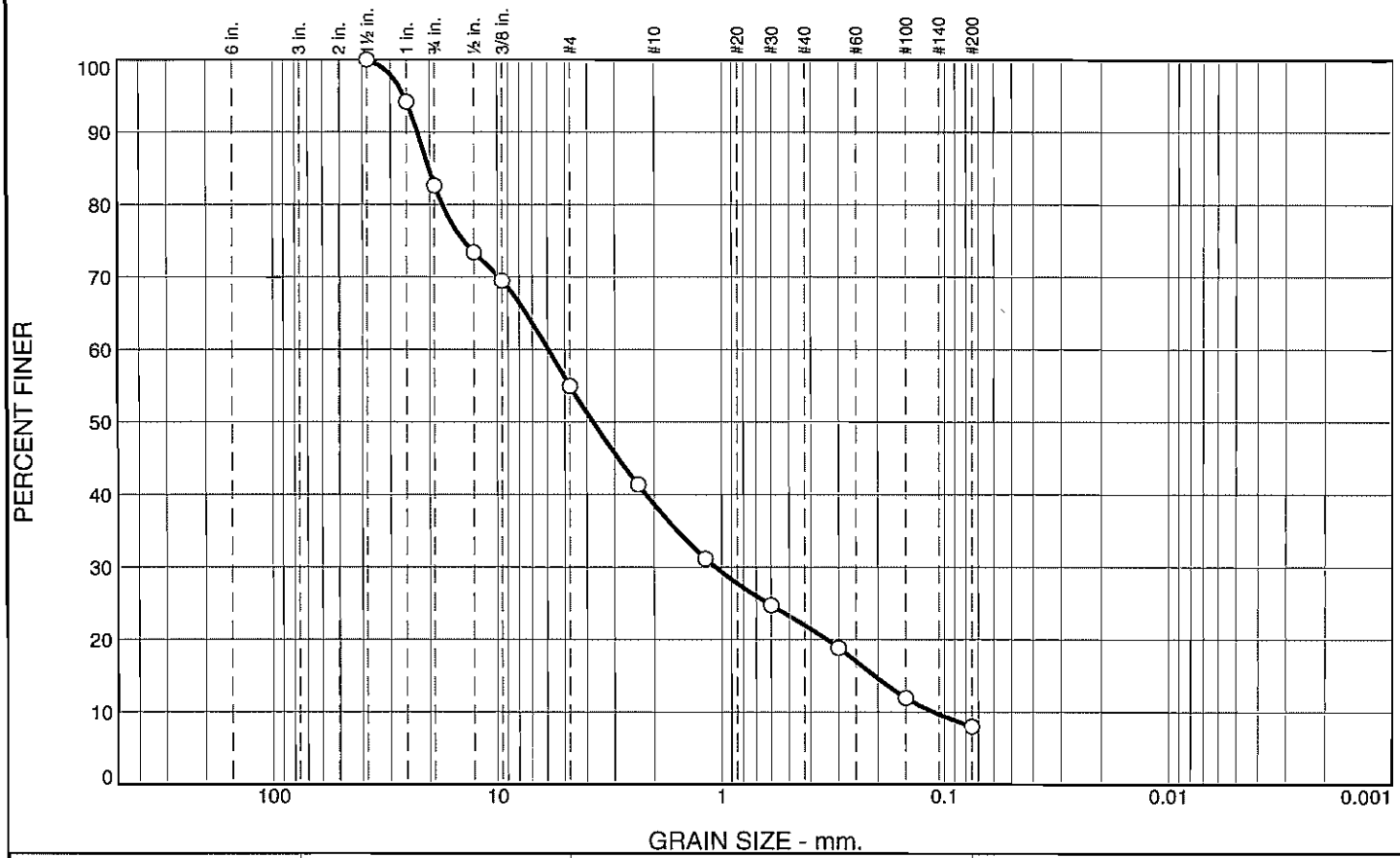
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.4	27.6	16.4	16.7	13.9	8.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	94.2		
3/4"	82.6		
1/2"	73.4		
3/8"	69.5		
#4	55.0		
#8	41.4		
#16	31.2		
#30	24.7		
#50	18.9		
#100	12.0		
#200	8.0		

* (no specification provided)

Material Description

Brown well-graded SAND with Silt and Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 22.7394 D_{85}= 20.2232 D_{60}= 5.9290
D_{50}= 3.7540 D_{30}= 1.0665 D_{15}= 0.2064
D_{10}= 0.1125 C_u= 52.71 C_c= 1.71

Classification

USCS= SW-SM AASHTO=

Remarks

Sample Number: B5-6C **Depth:** 20.0'

Date: 3-31-2011

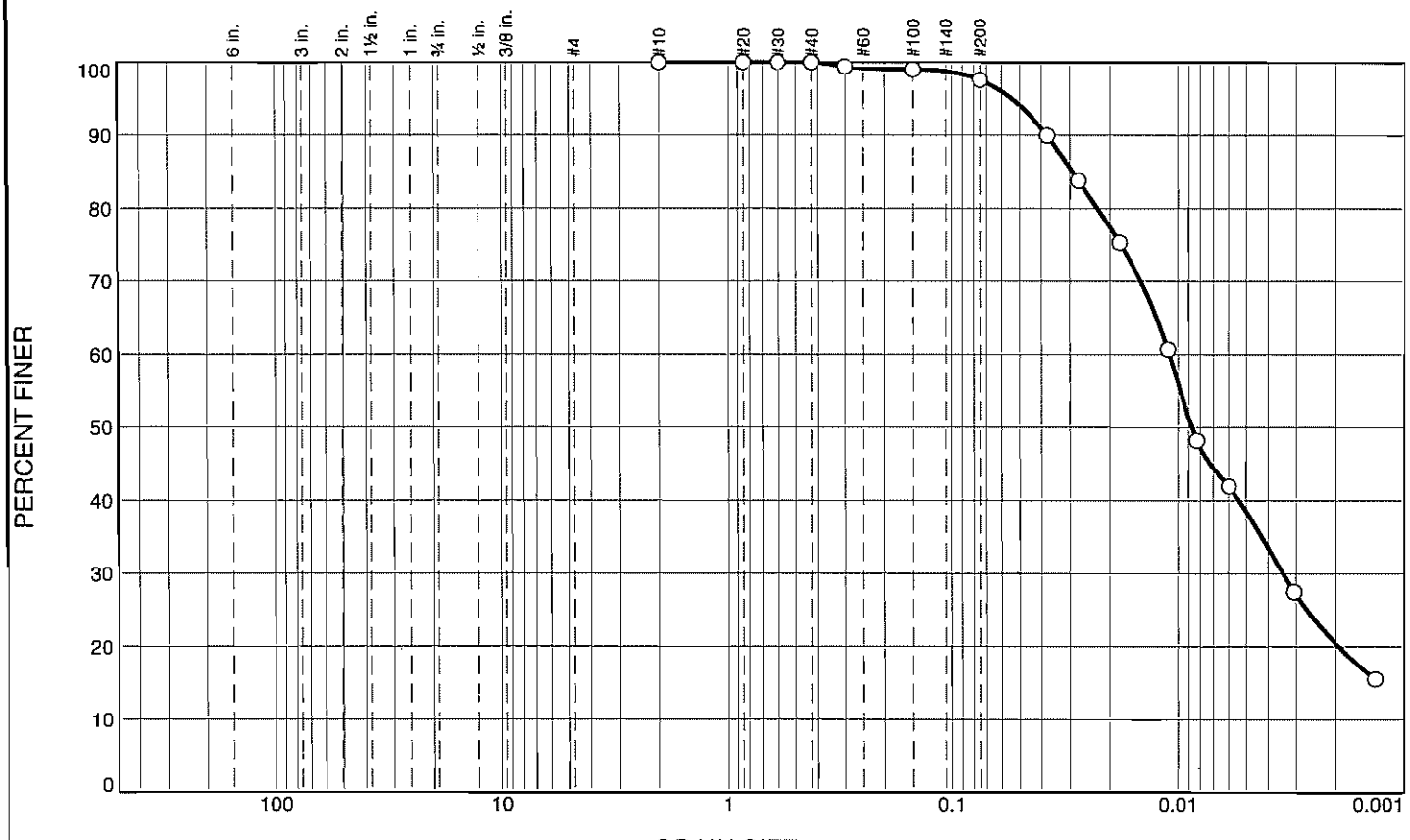
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	2.4	59.0	38.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#30	100.0		
#40	100.0		
#50	99.4		
#100	99.0		
#200	97.6		

* (no specification provided)

Material Description

Yellowish Brown Lean CLAY

Atterberg Limits

PL= 25 LL= 45 PI= 20

Coefficients

D_{90}= 0.0379 D_{85}= 0.0293 D_{60}= 0.0110
D_{50}= 0.0087 D_{30}= 0.0034 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(22)

Remarks

Sample Number: B24-2B **Depth:** 5.5'-6.0'

Date: 11-15-2010

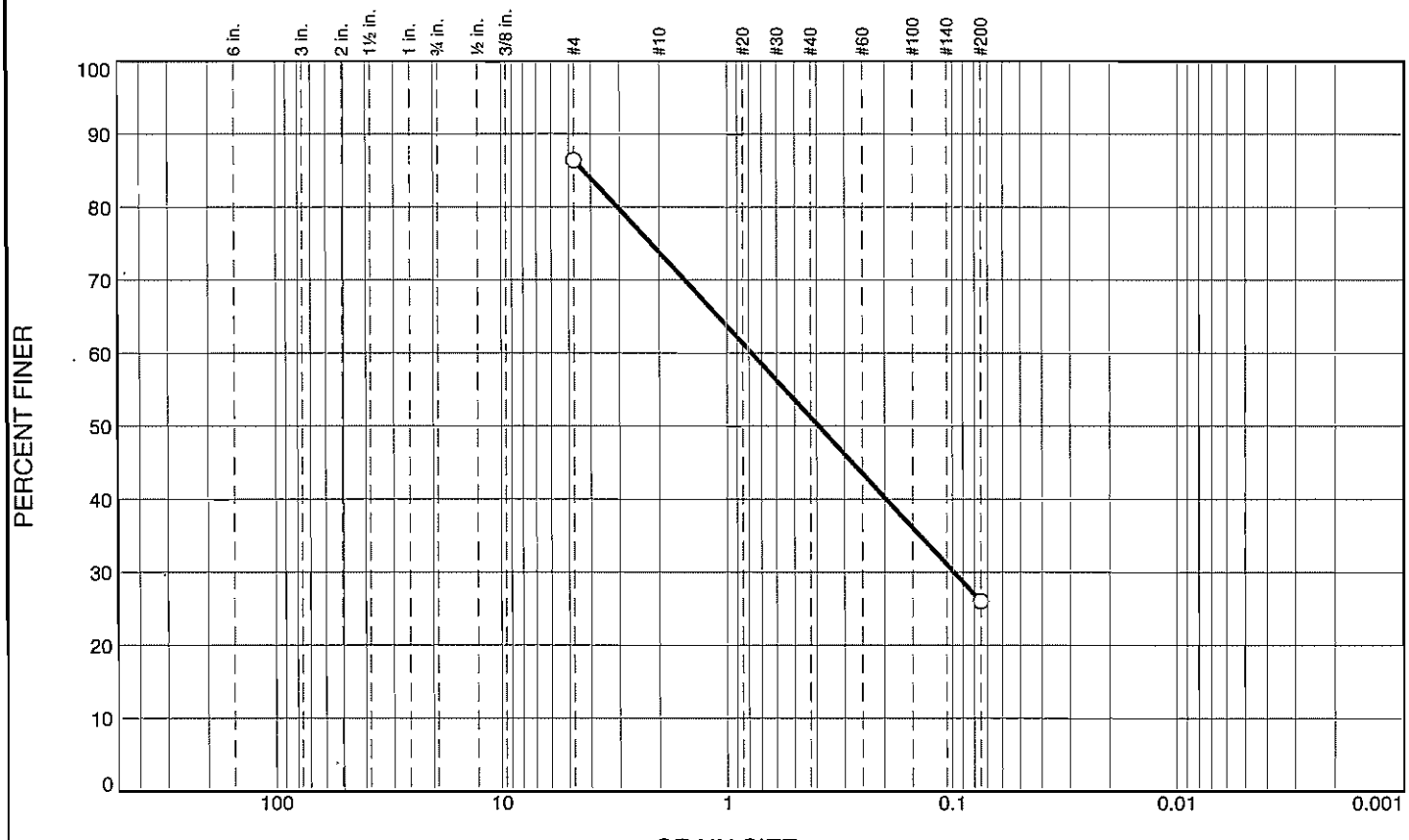
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			12.6	22.5	25.3	26.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	86.4		
#200	26.0		

* (no specification provided)

Material Description

Yellowish Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= 4.3196 D_{60}= 0.7752
D_{50}= 0.3900 D_{30}= 0.0987 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: B24-3B **Depth:** 10.5'-11.0'

Date: 11-11-2010

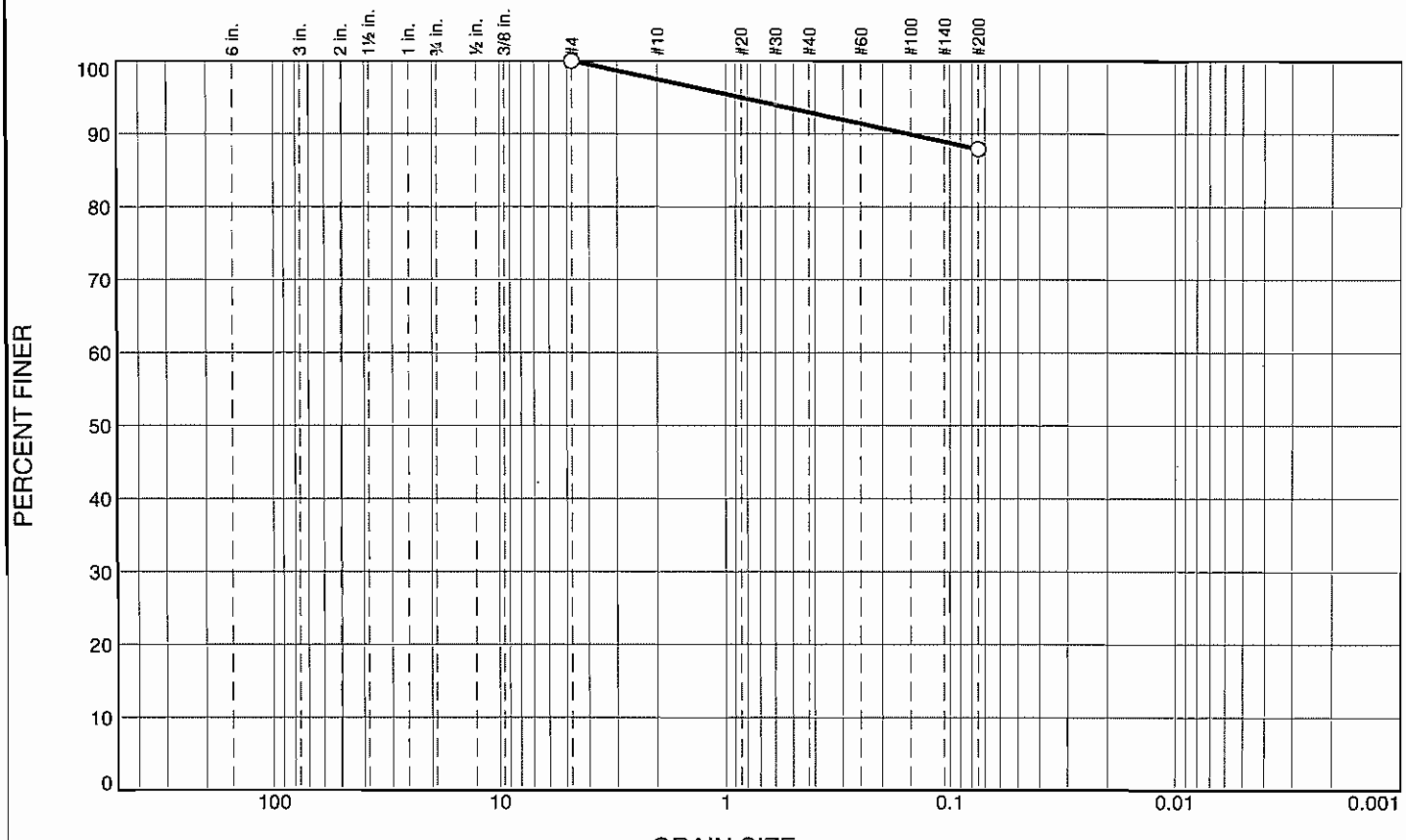
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.5	4.5	5.1	87.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#200	87.9		

* (no specification provided)

Material Description

Dark Yellowish Brown Fat CLAY

Atterberg Limits

PL= 21 LL= 63 PI= 42

Coefficients

D_{90}= 0.1539 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(40)

Remarks

Sample Number: B26-1B **Depth:** 2.5'-3.0'

Date: 11-11-2010

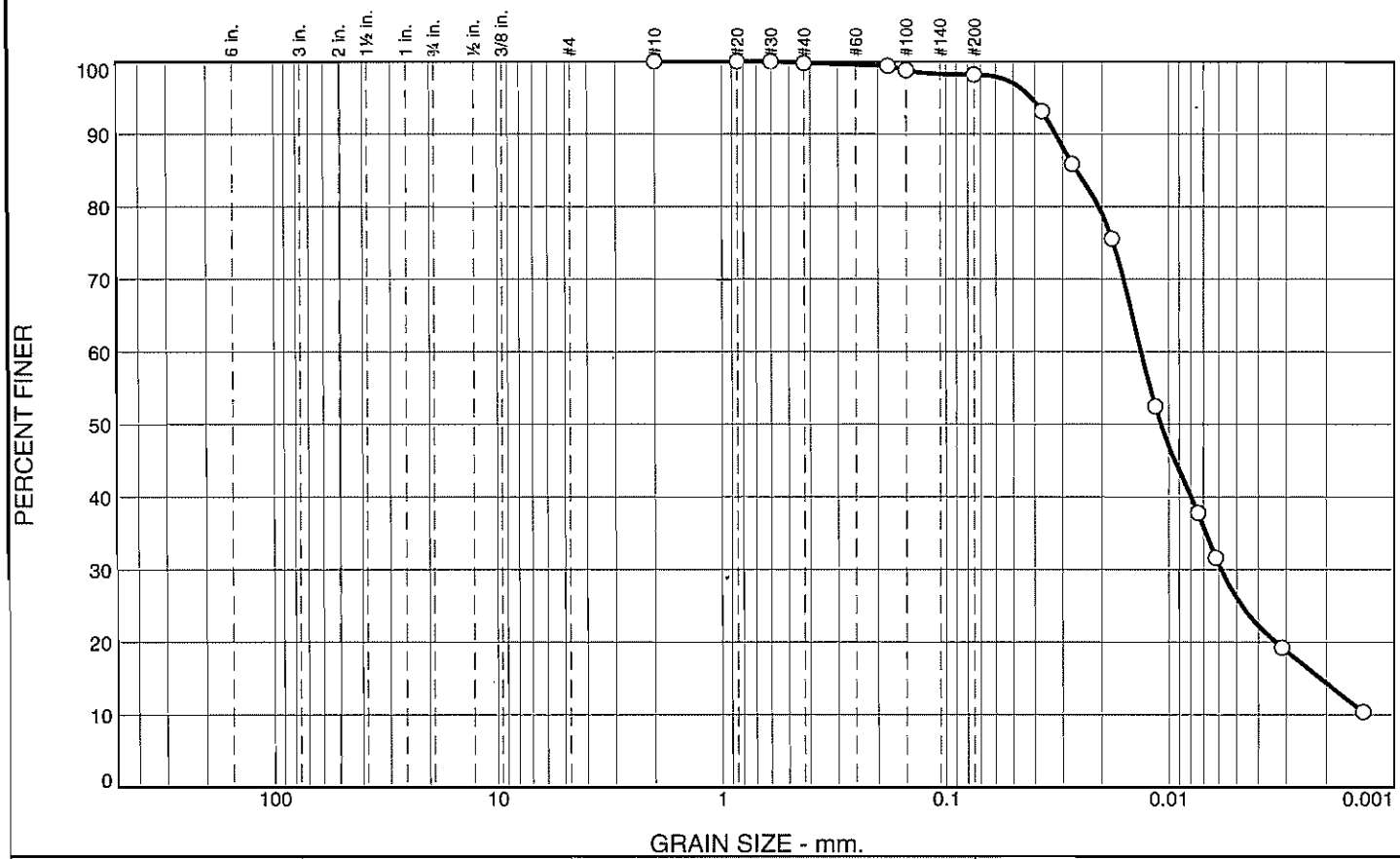
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	1.6	72.1	26.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#30	100.0		
#40	99.8		
#80	99.4		
#100	98.8		
#200	98.2		

* (no speeification provided)

Material Description

Yellowish Brown SILT

Atterberg Limits

PL= 29 LL= 40 PI= 11

Coefficients

D_{90}= 0.0324 D_{85}= 0.0261 D_{60}= 0.0133
D_{50}= 0.0108 D_{30}= 0.0059 D_{15}= 0.0021
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-6(13)

Remarks

Sample Number: B26-2B **Depth:** 5.5'-6.0'

Date: 11-15-2010

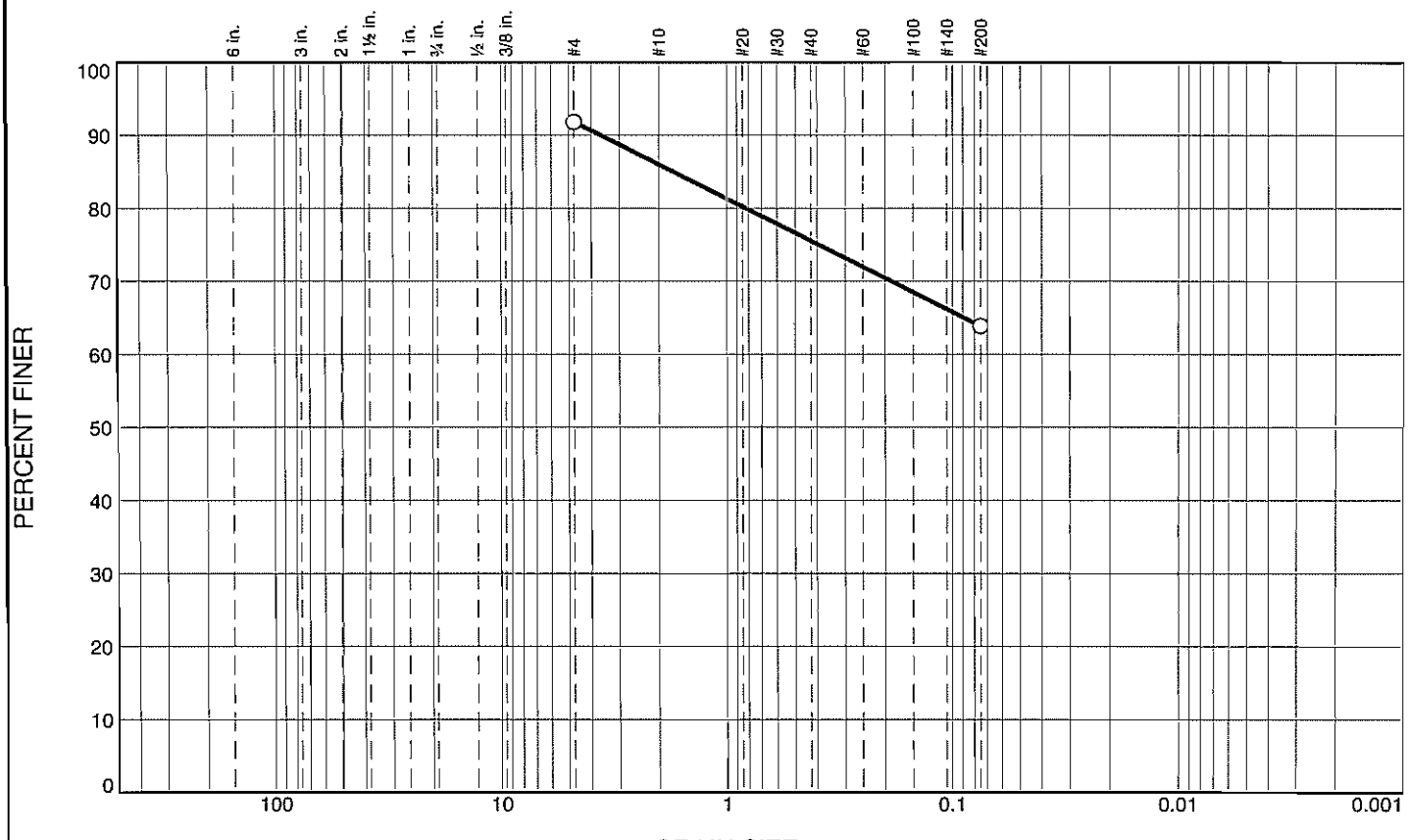
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			5.8	10.5	11.7	63.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	91.8		
#200	63.8		

* (no speeification provided)

Material Description

Very Dark Gray Sandy Silty CLAY

Atterberg Limits

PL= 17 LL= 24 PI= 7

Coefficients

D_{90}= 3.6249 D_{85}= 1.7269 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(2)

Remarks

Sample Number: B32-1B **Depth:** 2.5'-3.0'

Date: 11-11-2010

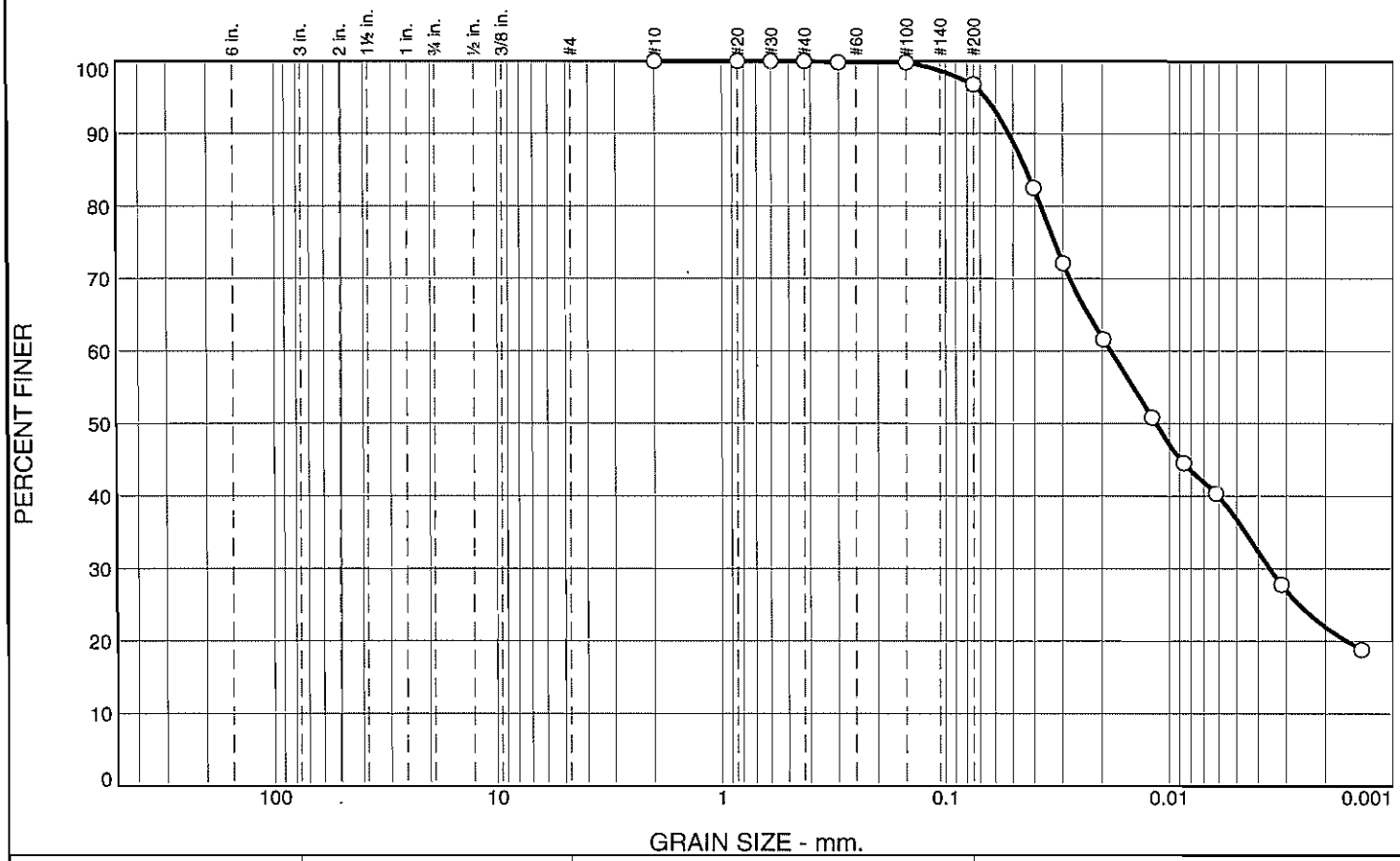
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	3.2	60.0	36.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#30	100.0		
#40	100.0		
#50	99.8		
#100	99.8		
#200	96.8		

* (no specification provided)

Material Description

Yellowish Brown SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0523 D_{85}= 0.0437 D_{60}= 0.0183
D_{50}= 0.0115 D_{30}= 0.0036 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample Number: B32-3B **Depth:** 10.5'-11.0'

Date: 11-15-2010

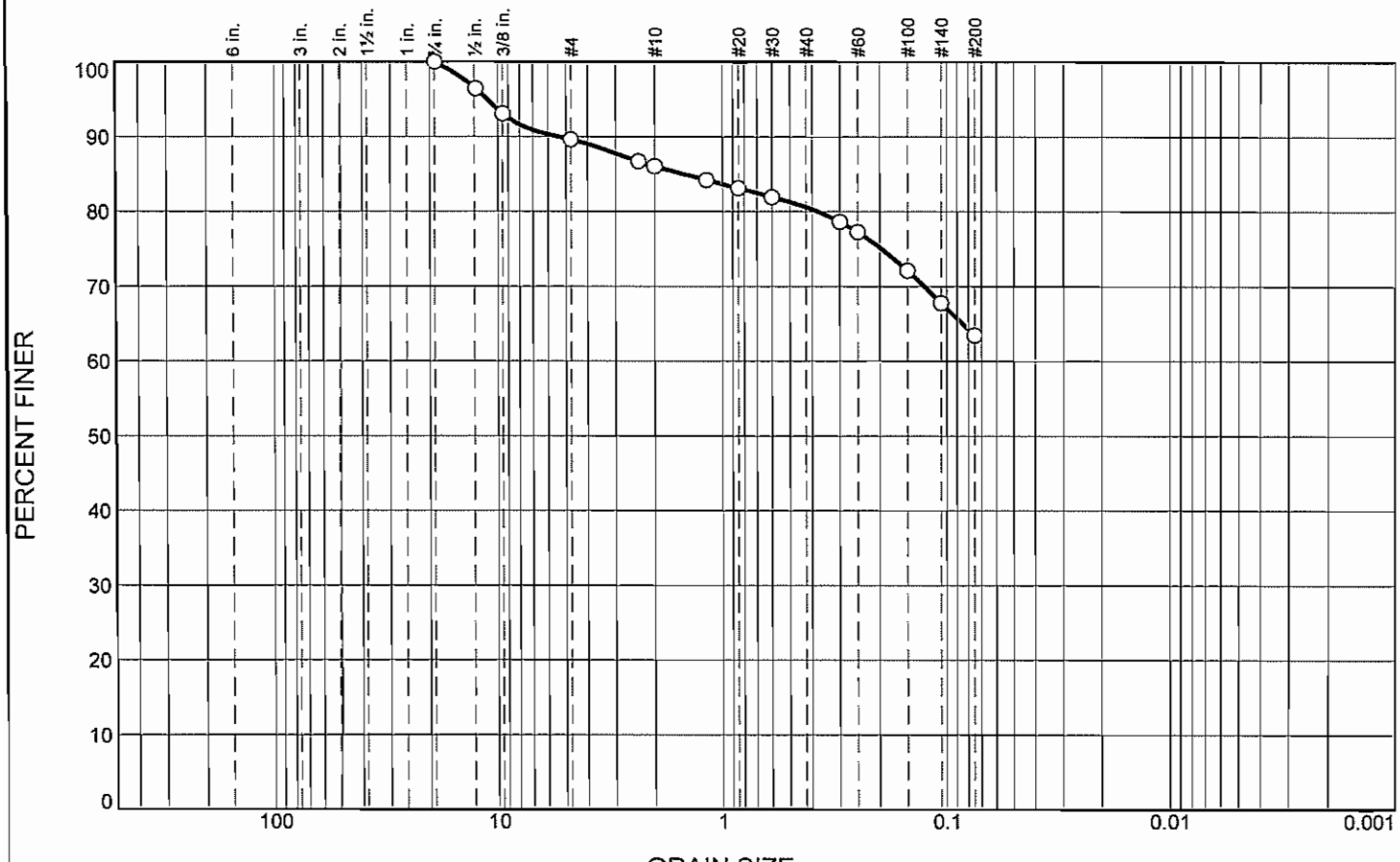
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.4	3.6	5.4	17.1	63.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	96.4		
3/8"	93.1		
#4	89.6		
#8	86.7		
#10	86.0		
#16	84.2		
#20	83.1		
#30	81.9		
#50	78.6		
#60	77.2		
#100	72.1		
#140	67.8		
#200	63.5		

* (no specification provided)

Soil Description

Fat CLAY and SILTY CLAY with SAND, trace GRAVEL, dark grayish brown and very dark gray

Atterberg Limits

PL= 17 LL= 42 PI= 25

Coefficients

D_{90}= 5.4170 D_{85}= 1.4996 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(13)

Remarks

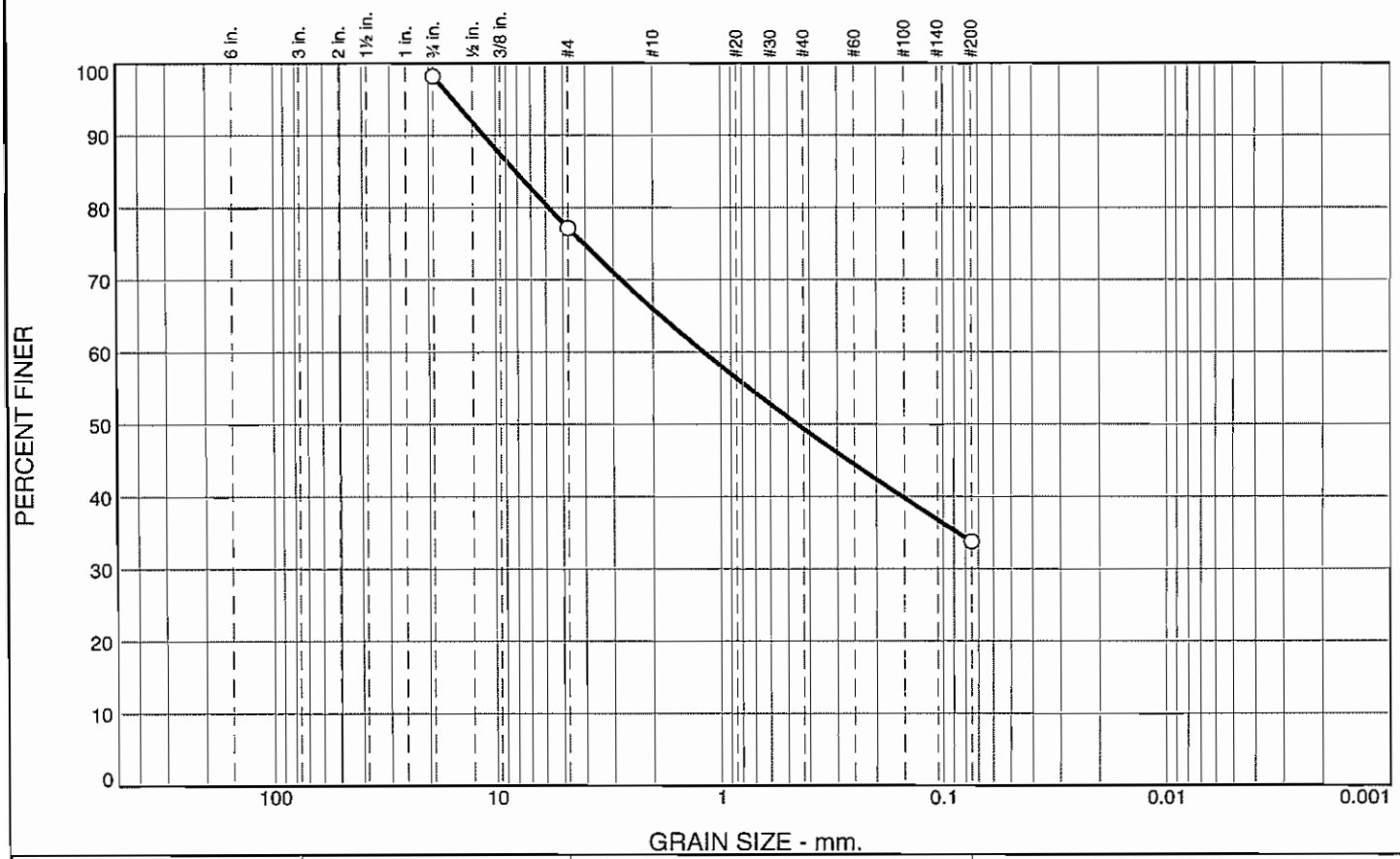
Source of Sample: Composite B31 & B35 **Depth:** 1.5-4.5'
Sample Number: 1 **Date:** 10/26/10

Blackburn Consulting

W. Sacramento, CA

Client: CDM
Project: Napa-Sonoma Pipeline
Project No: 2049.1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		21.0	11.2	16.6	15.7	33.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	98.2		
#4	77.2		
#200	33.7		

* (no specification provided)

Material Description

Dark Yellow Clayey SAND with Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 11.2785 D_{85}= 8.1333 D_{60}= 1.1918
D_{50}= 0.4526 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample Number: B36-3C **Depth:** 6.0'-6.5'

Date: 4-18-2011

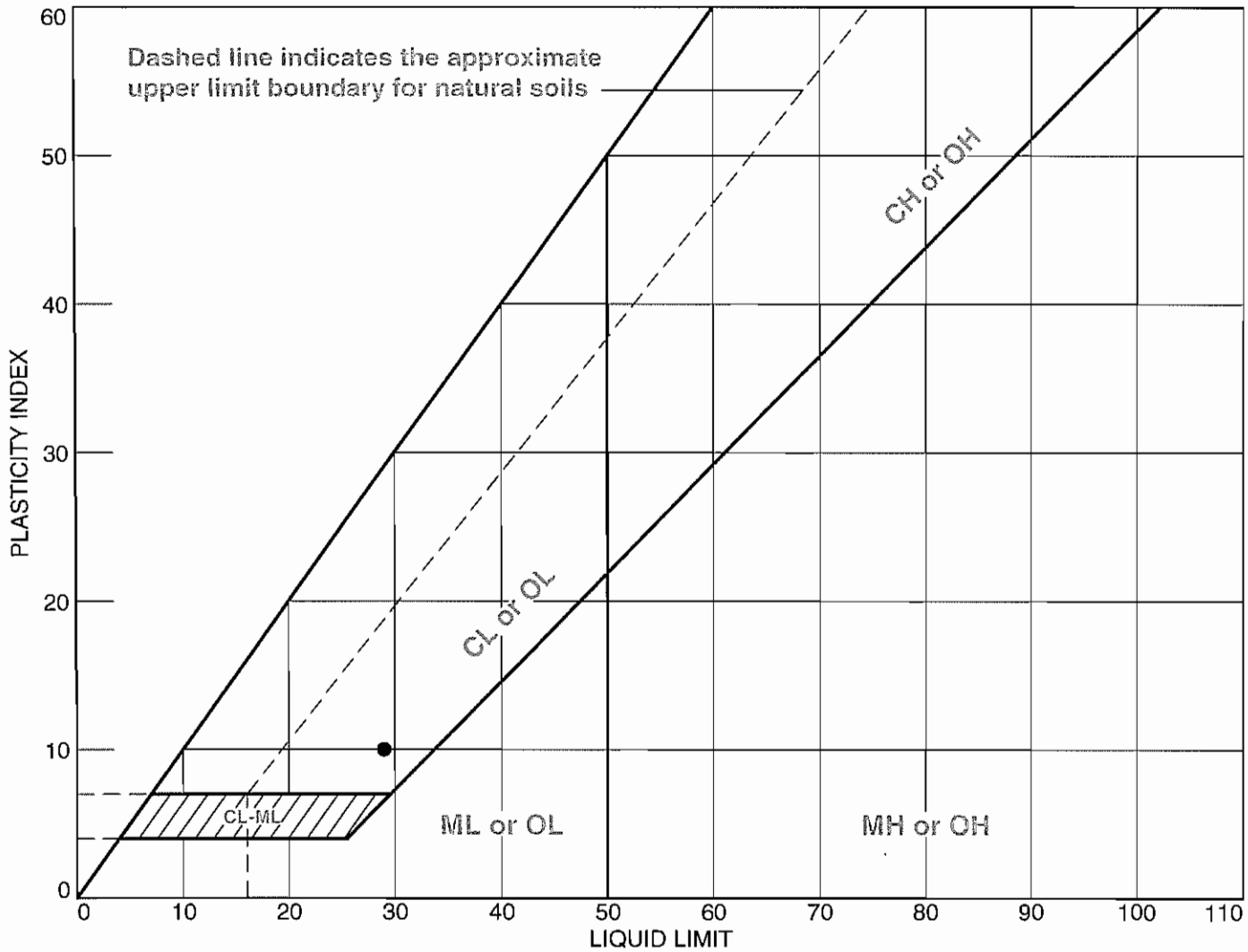
Blackburn Consulting

Auburn, CA

Client: CDM
Project: Napa - Sonoma Pipeline
Project No: 2049.1 **Figure**

Tested By: KC **Checked By:** KC

LIQUID AND PLASTIC LIMITS TEST REPORT

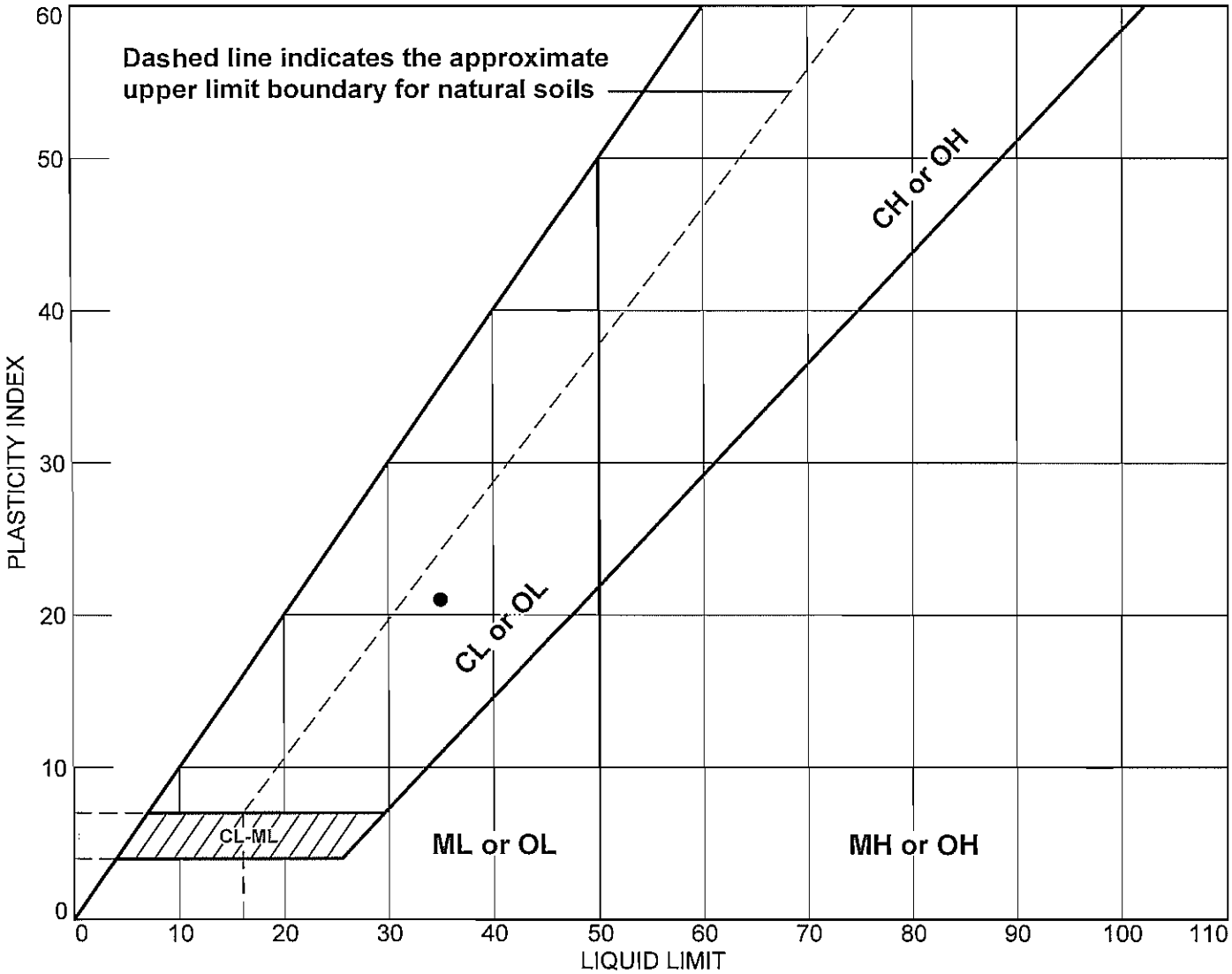


SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		B1-1 & B5-1 Combined	1.5'-3.0'		19	29	10	SC

Blackburn Consulting **Auburn, CA**	**Client:** CDM **Project:** Napa - Sonoma Pipeline **Project No.:** 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

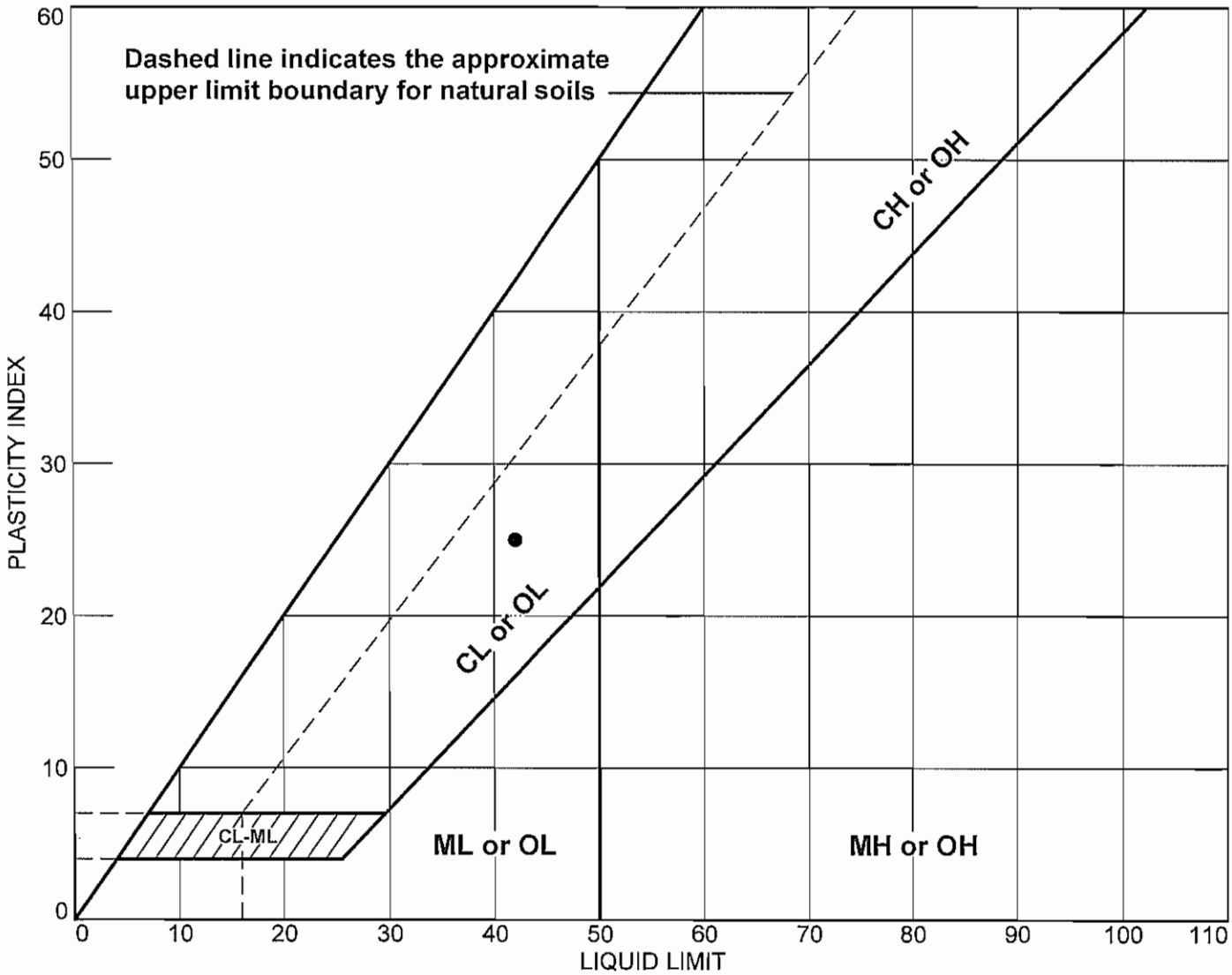
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Composite B12 & B14	1	1.5-4.5'		14	35	21	CL

Blackburn Consulting **W. Sacramento, CA**	**Client:** CDM **Project:** Napa-Sonoma Pipeline **Project No.:** 2049.1

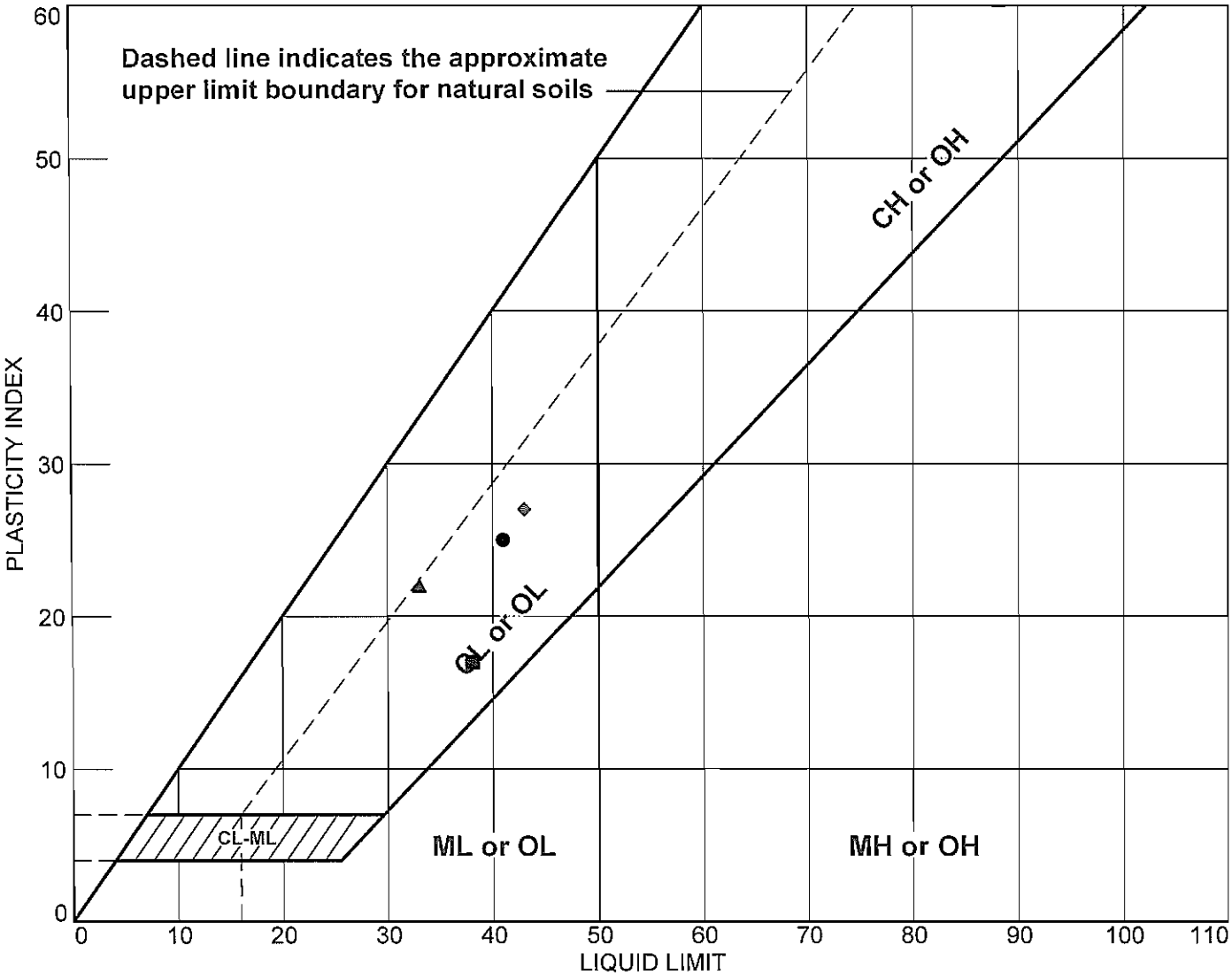
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Composite B31 & B35	1	1.5-4.5'		17	42	25	CL

Blackburn Consulting **W. Sacramento, CA**	**Client:** CDM **Project:** Napa-Sonoma Pipeline **Project No.:** 2049.1

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-7	1	1.5-4.5'		16	41	25	CL
■	B-8	7c	31.0-31.5'		21	38	17	CL
▲	B-13	2c	6.0-6.5'		11	33	22	CL
◆	B-15	1c	3.0-3.5'		16	43	27	CL

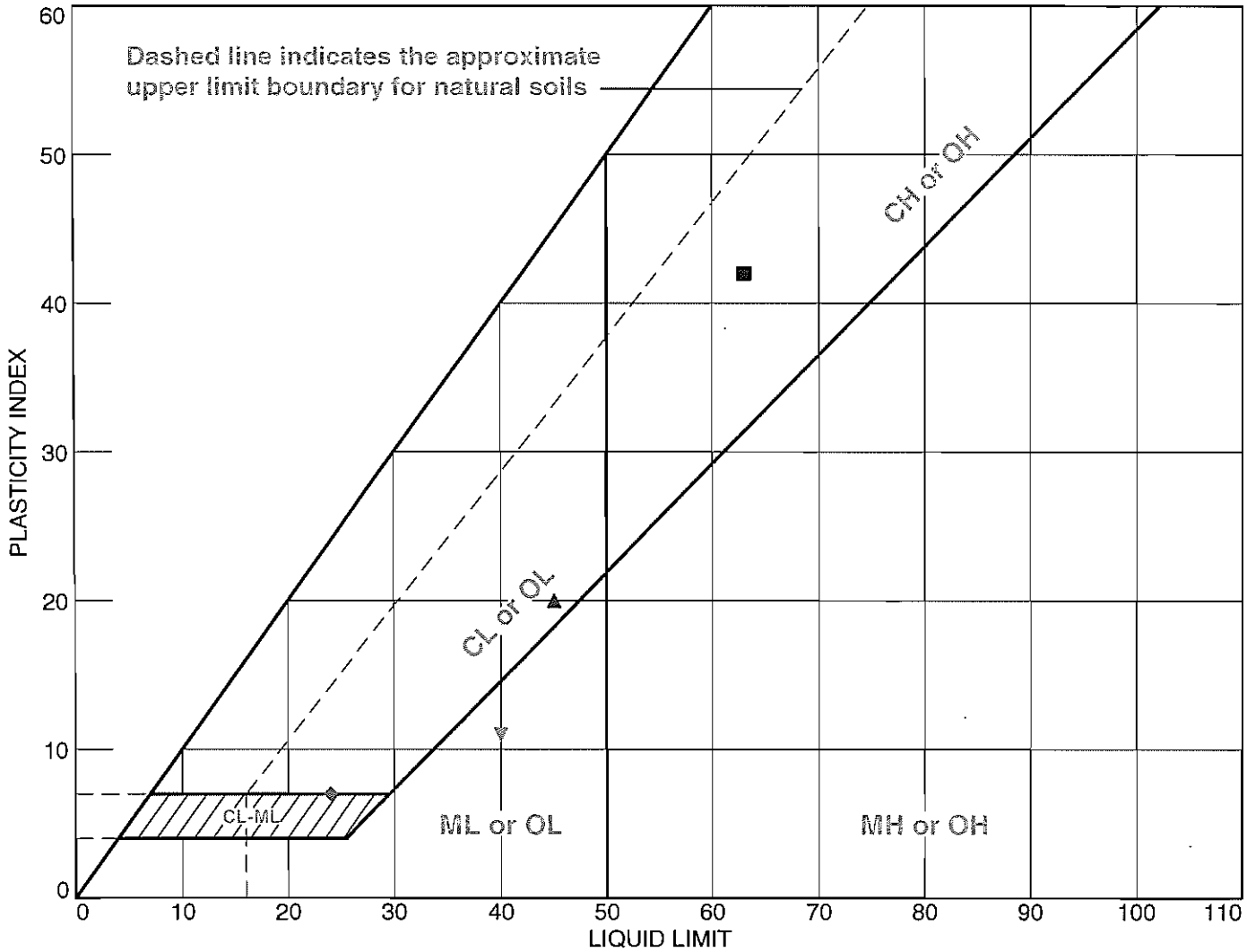
Blackburn Consulting

W. Sacramento, CA

Client: CDM
Project: Napa-Sonoma Pipeline

Project No.: 2049.1

LIQUID AND PLASTIC LIMITS TEST REPORT

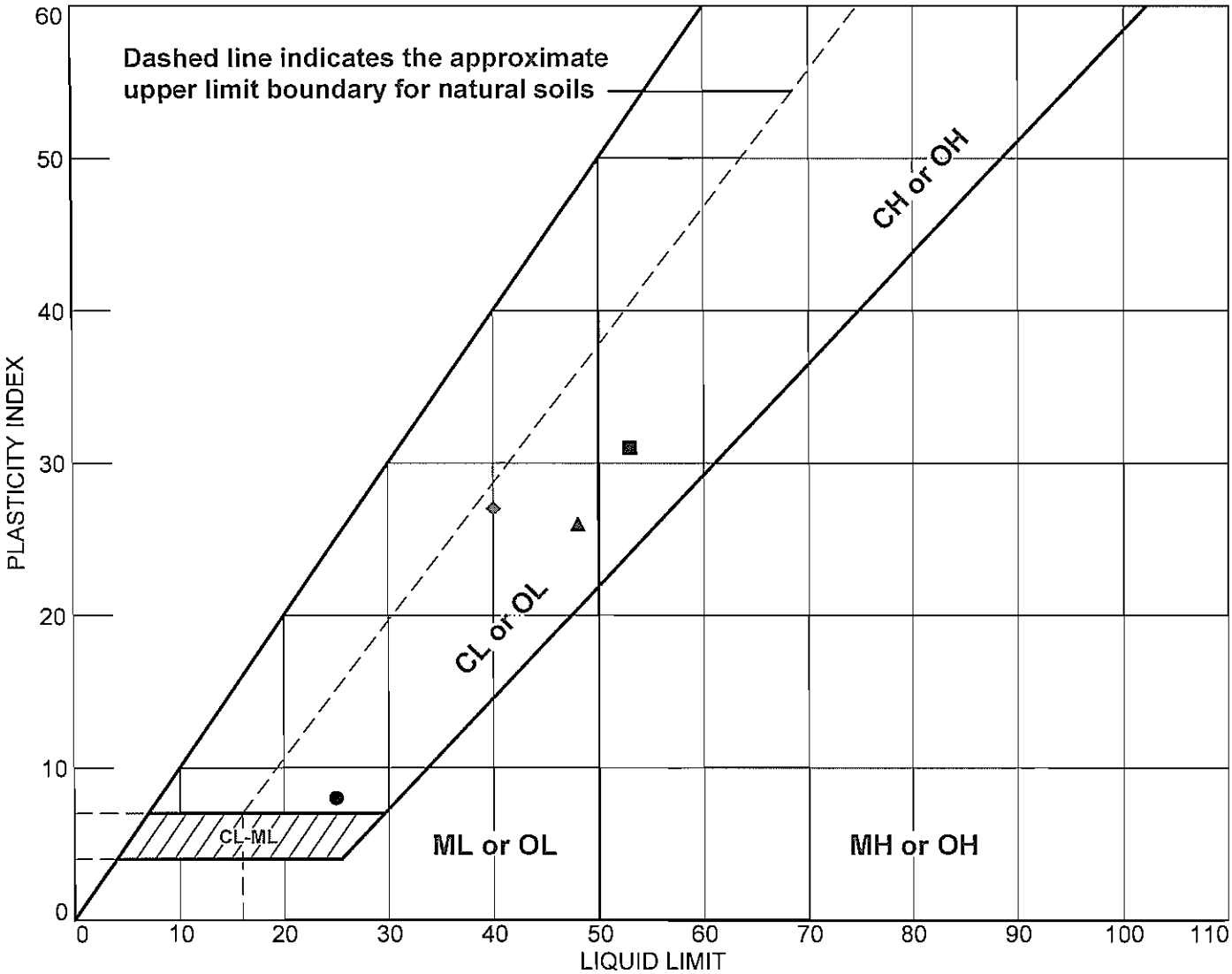


SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		B1-6	16.5'-18.0'		NP	NV	NP	SM
■		B26-1B	2.5'-3.0'		21	63	42	CH
▲		B24-2B	5.5'-6.0'		25	45	20	CL
◆		B32-1B	2.5'-3.0'		17	24	7	CL-ML
▼		B26-2B	5.5'-6.0'		29	40	11	ML

Blackburn Consulting **Auburn, CA**	**Client:** CDM **Project:** Napa - Sonoma Pipeline **Project No.:** 2049.1 **Figure**

Tested By: KLC **Checked By:** KLC

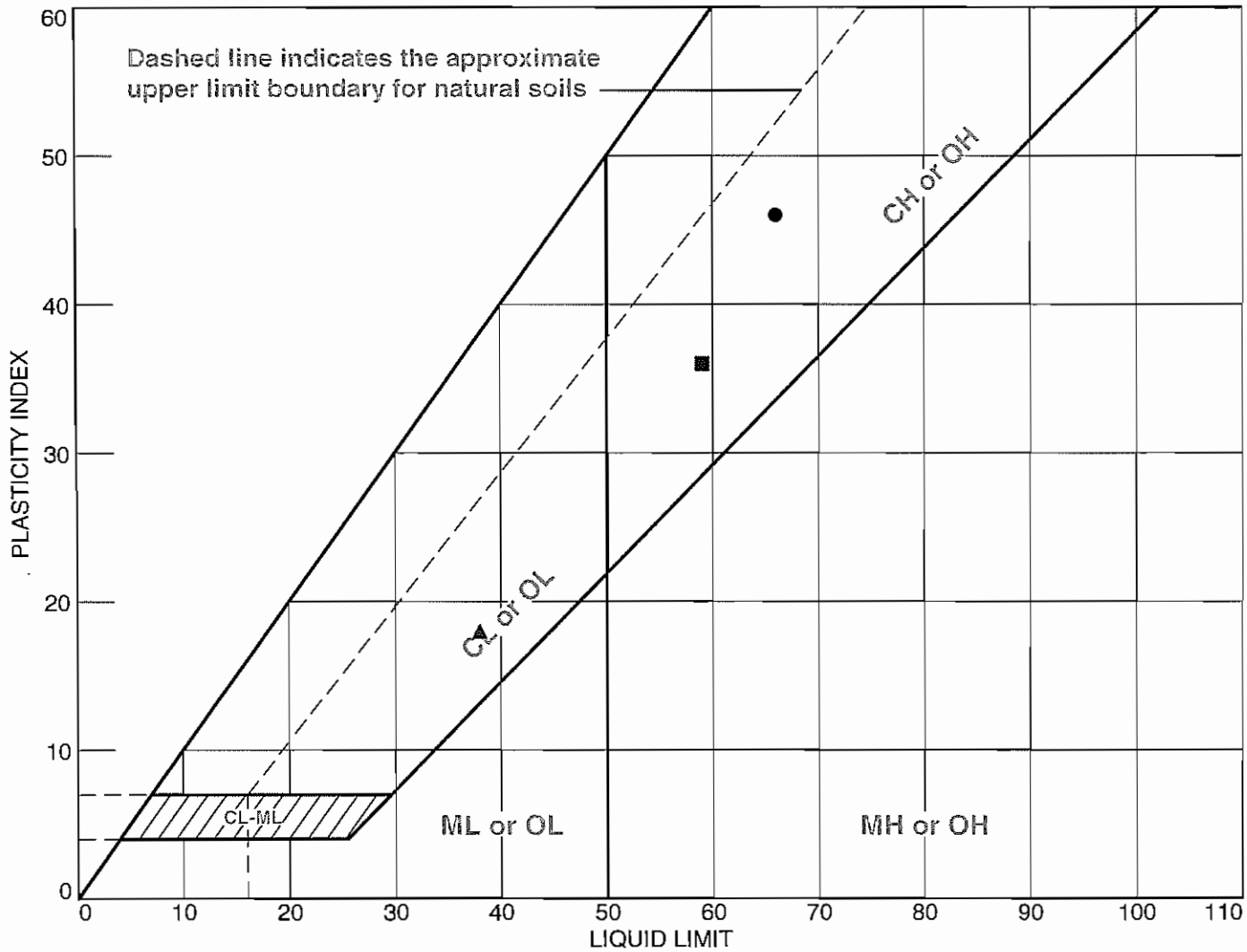
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-20	1c	3.0-3.5'		17	25	8	CL
■	B-28	4c	16.0-16.5'		22	53	31	CH
▲	B-29	3c	11.0-11.5'		22	48	26	CL
◆	B-34	1c	3.0-3.5'		13	40	27	CL

Blackburn Consulting **W. Sacramento, CA**	**Client:** CDM **Project:** Napa-Sonoma Pipeline **Project No.:** 2049.1

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		B37-3B	5.5'-6.0'		20	66	46	CH
■		B36-4B	10.5'-11.0'		23	59	36	CH
▲		B1-10B	35.5-36.0		20	38	18	CL

Blackburn Consulting **Auburn, CA**	**Client:** CDM **Project:** Napa - Sonoma Pipeline **Project No.:** 2049.1 **Figure**

Tested By: ○ KLC □ KLC △ BWM **Checked By:** KLC

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipline
Project Number: 2049.1
Sample: B1-4b Depth: 10.5-11.0'
Sample Description: SILT/CLAY (ML/CL), dark yellowish brown, slightly cemented
Date: 4/9/2011
Tested By: MDR

Original Sample Length	5.481
Original Diameter (in)	2.407
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.55

Test Results

Axial Strain at Max. Load	2.0%
Average cross-sectional area (in^2)	4.64
Deflection at Max. Load (in)	0.110
Maximum Load (lbs)	87
Strain at Failure (%)	0.60
Compressive Strength (tsf)	**1.35**

Moisture Density

Tube and Sample (g)	783.02
Tube (g)	0.00
Sample Weight (g)	783.02
Tare Number	D6
Tare Weight (g)	169.31
Wet Weight (g)	600.43
Dry Weight (g)	522.80
Dry Weight (g)	353.49
Water Weight (g)	77.63
Percent Moisture (%)*	22.0
Wet Density (pcf)	119.6
Dry Density (pcf)	98.1

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

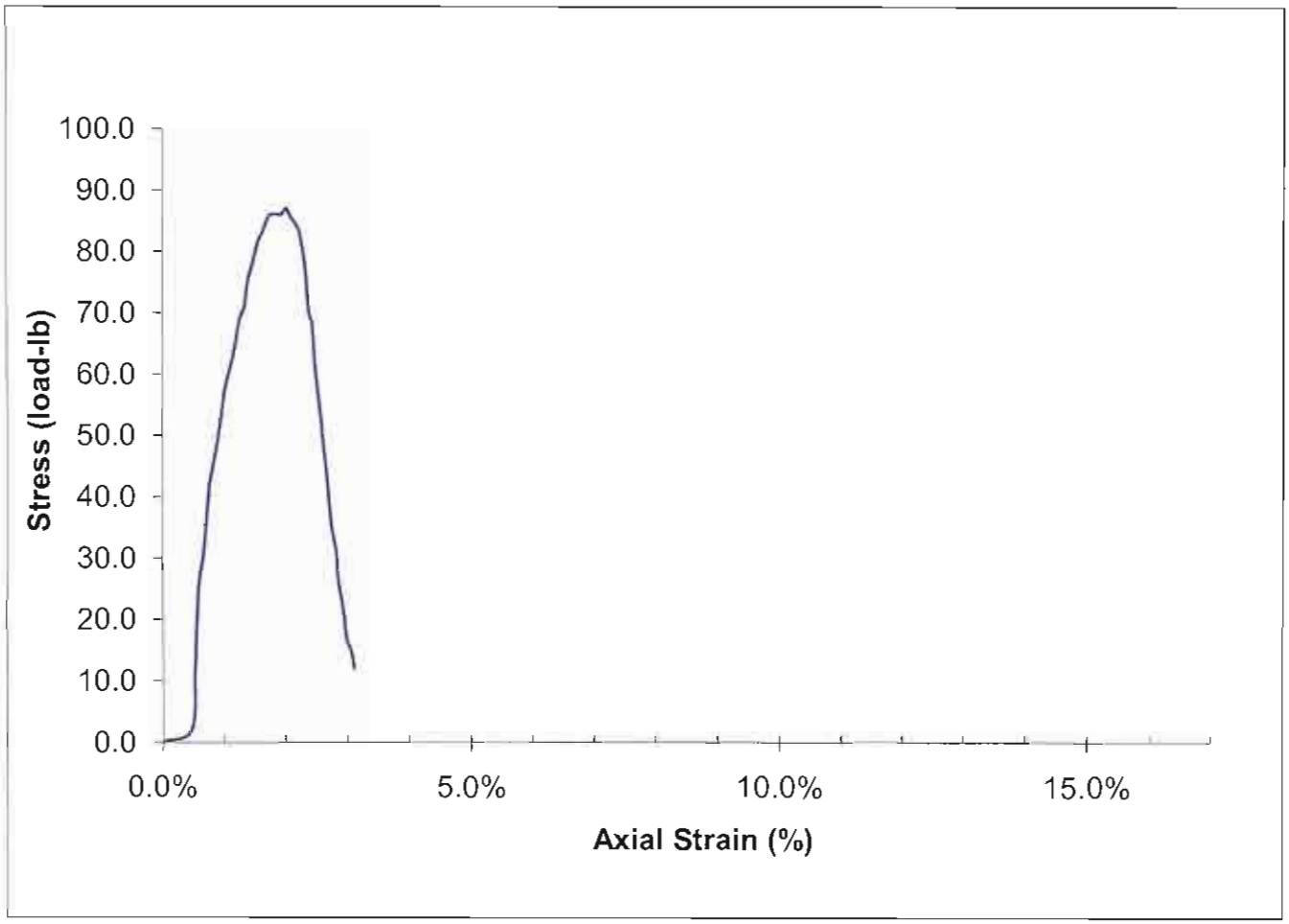
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.026	2	0.079	77	0.133	68		
0.029	12	0.083	80	0.136	60		
0.032	25	0.086	82	0.140	54		
0.036	30	0.089	83	0.143	48		
0.039	36	0.093	85	0.146	43		
0.042	42	0.096	86	0.150	35		
0.046	46	0.099	86	0.154	31		
0.049	49	0.103	86	0.156	26		
0.053	54	0.106	86	0.160	22		
0.056	58	0.110	87	0.163	17		
0.059	60	0.113	86	0.167	15		
0.063	63	0.116	85	0.170	12		
0.066	66	0.120	84				
0.069	69	0.123	82				
0.073	71	0.127	77				
0.076	75	0.130	70				

Project
Napa-Sonoma Pipline
Project Number
2049.1
Sample Number
B1-4b
Material Description
SILT/CLAY (ML/CL), dark yellowish brown, slightly cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	119.6
Dry Density (pcf)	98.1
% Moisture	22.0

Unconfined Compressive Strength (tsf)	1.35

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B2-2c Depth: 6.0-6.5'
Sample Description: Lean CLAY, black
Date: 11/13/2010
Tested By: MDR

Original Sample Length	4.990
Original Diameter (in)	2.392
Height-to-Diameter Ratio	2.1 : 1
Sample Area (in^2)	4.49

Test Results

Axial Strain at Max. Load	5.7%
Average cross-sectional area (in^2)	4.76
Deflection at Max. Load (in)	0.283
Maximum Load (lbs)	102
Strain at Failure (%)	1.41
Compressive Strength (tsf)	**1.54**

Moisture Density

Tube and Sample (g)	681.20
Tube (g)	0.00
Sample Weight (g)	681.20
Tare Number	O
Tare Weight (g)	232.60
Wet Weight (g)	587.60
Dry Weight (g)	510.90
Dry Weight (g)	278.30
Water Weight (g)	76.70
Percent Moisture (%)*	27.6
Wet Density (pcf)	115.7
Dry Density (pcf)	90.7

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

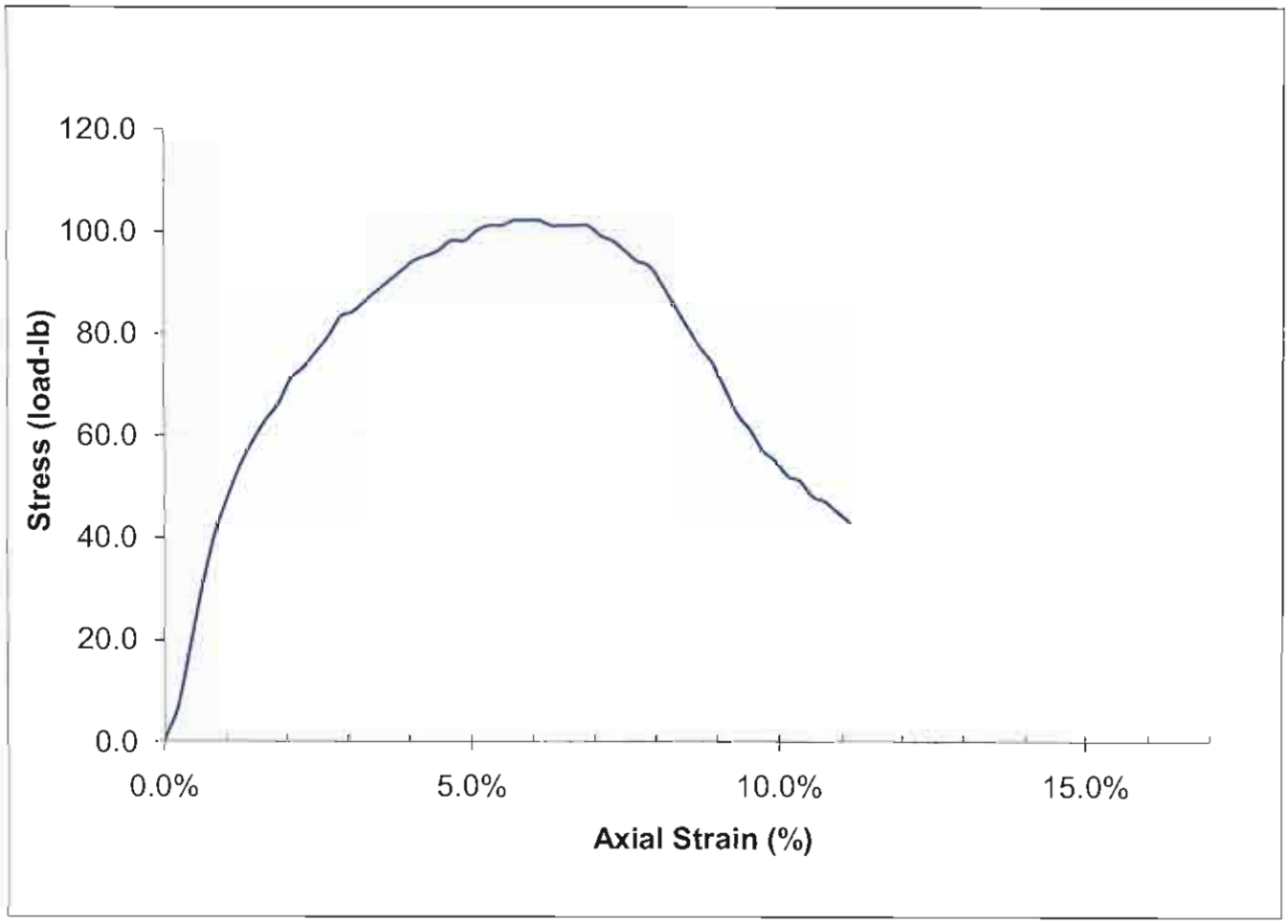
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.001	1	0.162	86	0.323	101	0.484	57
0.011	7	0.172	88	0.333	101	0.494	55
0.021	19	0.182	90	0.343	101	0.504	52
0.031	31	0.192	92	0.353	99	0.514	51
0.041	41	0.202	94	0.363	98	0.524	48
0.051	48	0.212	95	0.373	96	0.534	47
0.061	54	0.222	96	0.383	94	0.544	45
0.072	59	0.232	98	0.393	93	0.554	43
0.082	63	0.243	98	0.404	89	0.564	43
0.092	66	0.253	100	0.414	85	0.575	41
0.102	71	0.263	101	0.424	81	0.585	39
0.112	73	0.273	101	0.434	77	0.595	38
0.122	76	0.283	102	0.444	74	0.605	37
0.132	79	0.293	102	0.454	69	0.608	37
0.142	83	0.303	102	0.464	64		
0.152	84	0.313	101	0.474	61		

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B2-2c
Material Description
Lean CLAY, black
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	115.7
Dry Density (pcf)	90.7
% Moisture	27.6

Unconfined Compressive Strength (tsf)	1.54

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipline
Project Number: 2049.1
Sample: B7-5c Depth: 16.0-16.5'
Sample Description: Lean CLAY, brown, partially cemented
Date: 10/30/2010
Tested By: MDR

Original Sample Length	6.012
Original Diameter (in)	2.396
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.51

Test Results

Axial Strain at Max. Load	5.3%
Average cross-sectional area (in^2)	4.76
Deflection at Max. Load (in)	0.321
Maximum Load (lbs)	292
Strain at Failure (%)	1.93
Compressive Strength (tsf)	**4.41**

Moisture Density

Tube and Sample (g)	873.00
Tube (g)	0.00
Sample Weight (g)	873.00
Tare Number	O
Tare Weight (g)	232.60
Wet Weight (g)	716.30
Dry Weight (g)	609.20
Dry Weight (g)	376.60
Water Weight (g)	107.10
Percent Moisture (%)*	28.4
Wet Density (pcf)	122.7
Dry Density (pcf)	95.5

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

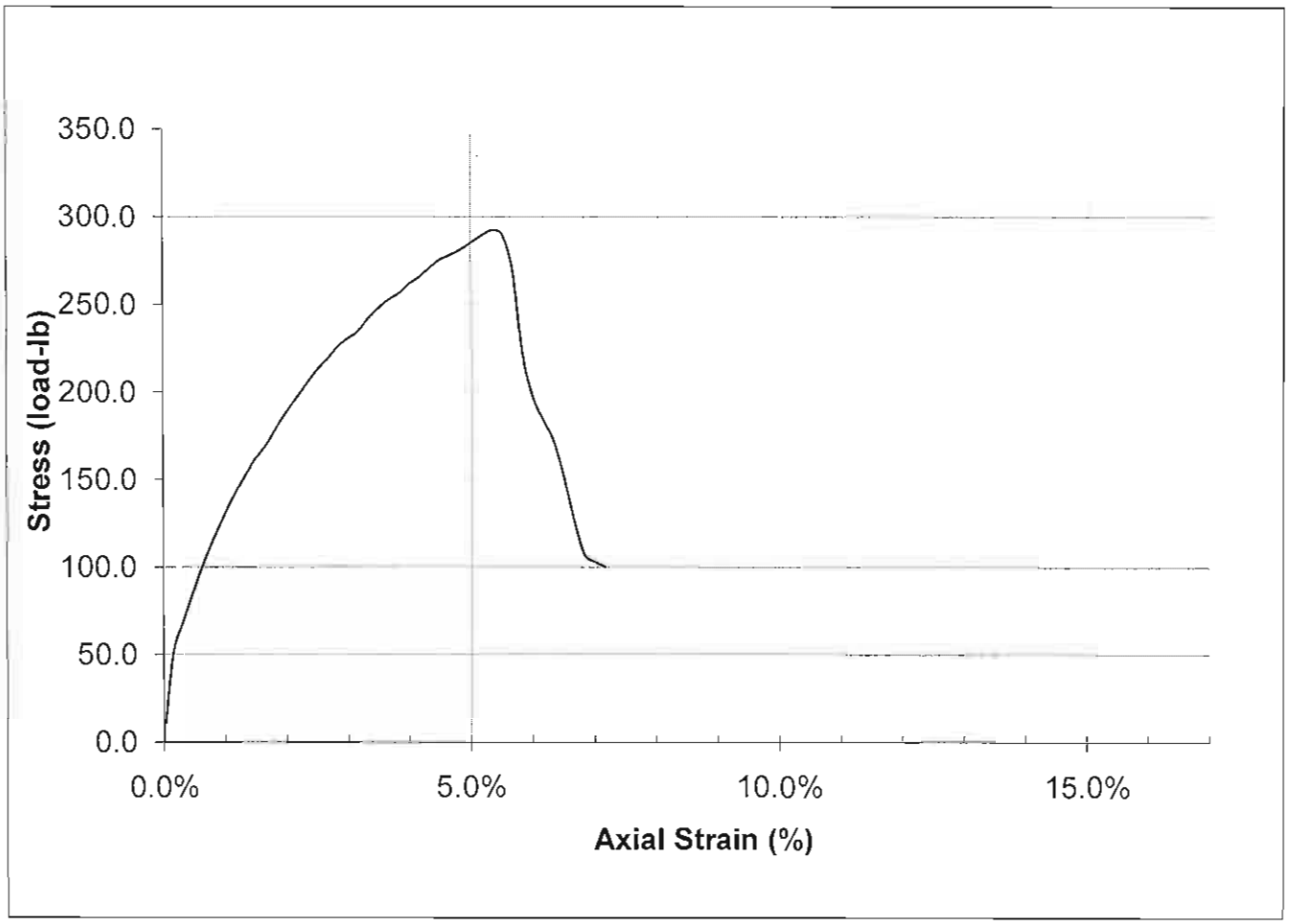
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
	2	0.160	218	0.321	292		
0.009	50	0.170	225	0.331	290		
0.019	69	0.180	230	0.341	270		
0.029	86	0.190	234	0.351	222		
0.039	102	0.200	241	0.361	197		
0.049	116	0.210	247	0.371	184		
0.059	129	0.220	252	0.381	172		
0.069	141	0.231	256	0.391	152		
0.079	151	0.240	261	0.401	127		
0.089	161	0.250	265	0.411	107		
0.101	170	0.260	270	0.421	103		
0.110	179	0.270	275	0.431	100		
0.120	188	0.281	278	0.442	98		
0.130	196	0.291	281	0.452	94		
0.140	204	0.301	285	0.462	92		
0.150	212	0.311	289	0.471	91		

Project
Napa-Sonoma Pipline
Project Number
2049.1
Sample Number
B7-5c
Material Description
Lean CLAY, brown, partially cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	122.7
Dry Density (pcf)	95.5
% Moisture	28.4

Unconfined Compressive Strength (tsf)	4.41

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B8-1c Depth: 3.0-3.5'
Sample Description: SANDY CLAY, very dark brown & brown, with fine-medium GRAVEL and rootlets
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.537
Original Diameter (in)	2.404
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.54

Test Results

Axial Strain at Max. Load	5.9%
Average cross-sectional area (in^2)	4.82
Deflection at Max. Load (in)	0.324
Maximum Load (lbs)	80
Strain at Failure (%)	1.79
Compressive Strength (tsf)	**1.19**

Moisture Density

Tube and Sample (g)	869.60
Tube (g)	0.00
Sample Weight (g)	869.60
Tare Number	F7
Tare Weight (g)	179.50
Wet Weight (g)	653.70
Dry Weight (g)	587.10
Dry Weight (g)	407.60
Water Weight (g)	66.60
Percent Moisture (%)*	16.3
Wet Density (pcf)	131.8
Dry Density (pcf)	113.3

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

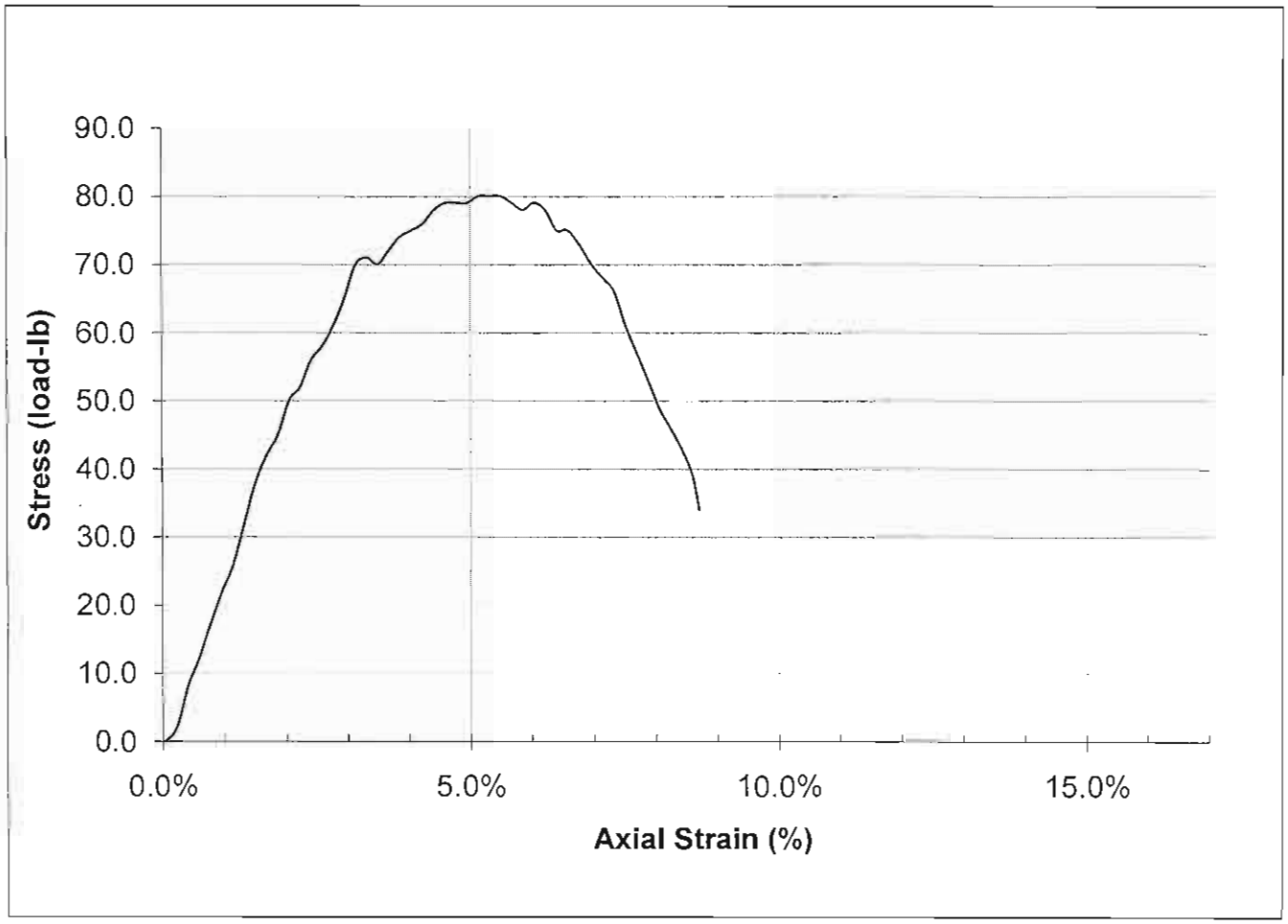
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.002	2	0.163	70	0.324	79	0.481	34
0.012	8	0.173	71	0.334	78		
0.022	12	0.183	70	0.344	75		
0.032	17	0.193	72	0.354	75		
0.042	22	0.203	74	0.364	73		
0.053	26	0.213	75	0.374	70		
0.063	32	0.224	76	0.385	68		
0.073	38	0.234	78	0.395	66		
0.083	42	0.244	79	0.405	61		
0.093	45	0.254	79	0.415	57		
0.103	50	0.264	79	0.425	53		
0.113	52	0.274	80	0.435	49		
0.123	56	0.284	80	0.445	46		
0.133	58	0.294	80	0.455	43		
0.143	61	0.304	79	0.465	39		
0.153	65	0.314	78	0.475	34		

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B8-1c
Material Description
SANDY CLAY, very dark brown & brown, with fine-medium GRAVEL and rootlets
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	131.8
Dry Density (pcf)	113.3
% Moisture	16.3

Unconfined Compressive Strength (tsf)	1.19

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B8-5c Depth: 21.0-21.5'
Sample Description: CLAYEY SILT (SILTY CLAY), brown/orange brown mottled
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.673
Original Diameter (in)	2.406
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.55

Test Results

Axial Strain at Max. Load	6.7%
Average cross-sectional area (in^2)	4.87
Deflection at Max. Load (in)	0.381
Maximum Load (lbs)	72
Strain at Failure (%)	2.16
Compressive Strength (tsf)	**1.06**

Moisture Density

Tube and Sample (g)	801.50
Tube (g)	0.00
Sample Weight (g)	801.50
Tare Number	F8
Tare Weight (g)	167.70
Wet Weight (g)	527.50
Dry Weight (g)	439.10
Dry Weight (g)	271.40
Water Weight (g)	88.40
Percent Moisture (%)*	32.6
Wet Density (pcf)	118.4
Dry Density (pcf)	89.3

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

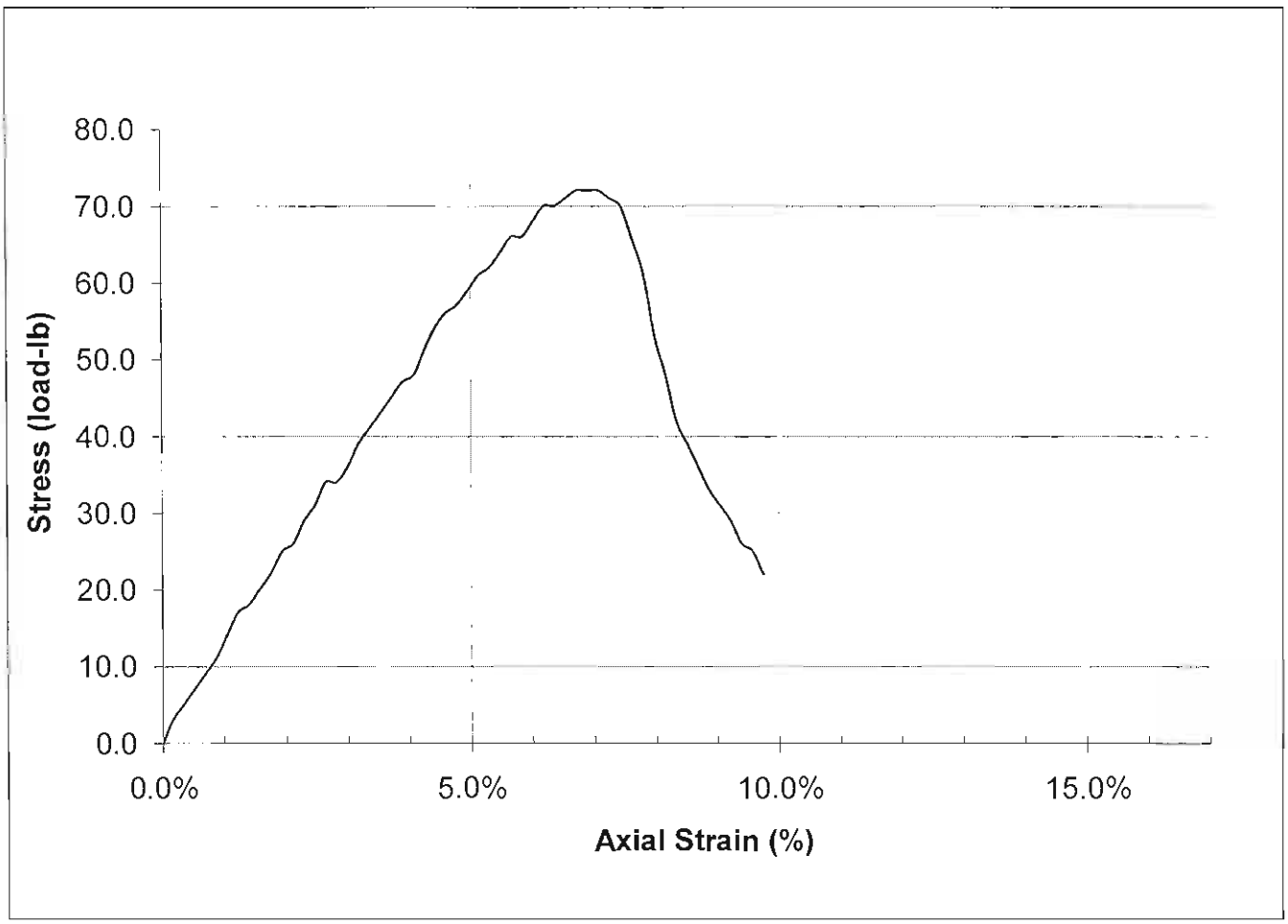
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
	2	0.160	34	0.321	66	0.482	39
0.009	3	0.170	36	0.331	66	0.492	36
0.019	5	0.180	39	0.341	68	0.502	33
0.029	7	0.190	41	0.351	70	0.512	31
0.039	9	0.200	43	0.361	70	0.522	29
0.049	11	0.210	45	0.371	71	0.532	26
0.059	14	0.220	47	0.381	72	0.542	25
0.069	17	0.231	48	0.391	72	0.552	22
0.079	18	0.240	51	0.401	72	0.562	20
0.089	20	0.250	54	0.411	71	0.569	18
0.099	22	0.260	56	0.421	70		
0.110	25	0.270	57	0.431	66		
0.120	26	0.281	59	0.442	61		
0.130	29	0.291	61	0.452	53		
0.140	31	0.301	62	0.462	48		
0.150	34	0.311	64	0.472	42		

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B8-5c
Material Description
CLAYEY SILT (SILTY CLAY), brown/orange brown mottled
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	118.4
Dry Density (pcf)	89.3
% Moisture	32.6

Unconfined Compressive Strength (tsf)	1.06

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B16-1c Depth: 3.0-3.5'
Sample Description: SILT with SAND, dark grayish brown
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.463
Original Diameter (in)	2.376
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.43

Test Results

Axial Strain at Max. Load	0.0%
Average cross-sectional area (in^2)	4.43
Deflection at Max. Load (in)	0.000
Maximum Load (lbs)	0
Strain at Failure (%)	0.00
Compressive Strength (tsf)	**0.00**

Moisture Density

Tube and Sample (g)	1028.60
Tube (g)	392.10
Sample Weight (g)	636.50
Tare Number	F9
Tare Weight (g)	186.10
Wet Weight (g)	548.90
Dry Weight (g)	520.40
Dry Weight (g)	334.30
Water Weight (g)	28.50
Percent Moisture (%)*	8.5
Wet Density (pcf)	100.1
Dry Density (pcf)	92.2

Remarks:

* % moisture taken after test.

Sample fell apart during extraction

Compression Tests

Dial reading @ 0 lb	0.000

Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B18-2c Depth: 6.0-6.5'
Sample Description: Lean CLAY with SAND, yellowish brown & brownish yellow, slightly cemented
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.540
Original Diameter (in)	2.397
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.51

Test Results

Axial Strain at Max. Load	3.9%
Average cross-sectional area (in^2)	4.70
Deflection at Max. Load (in)	0.218
Maximum Load (lbs)	143
Strain at Failure (%)	1.21
Compressive Strength (tsf)	**2.19**

Moisture Density

Tube and Sample (g)	798.00
Tube (g)	0.00
Sample Weight (g)	798.00
Tare Number	G1
Tare Weight (g)	191.30
Wet Weight (g)	622.40
Dry Weight (g)	543.20
Dry Weight (g)	351.90
Water Weight (g)	79.20
Percent Moisture (%)*	22.5
Wet Density (pcf)	121.6
Dry Density (pcf)	99.3

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

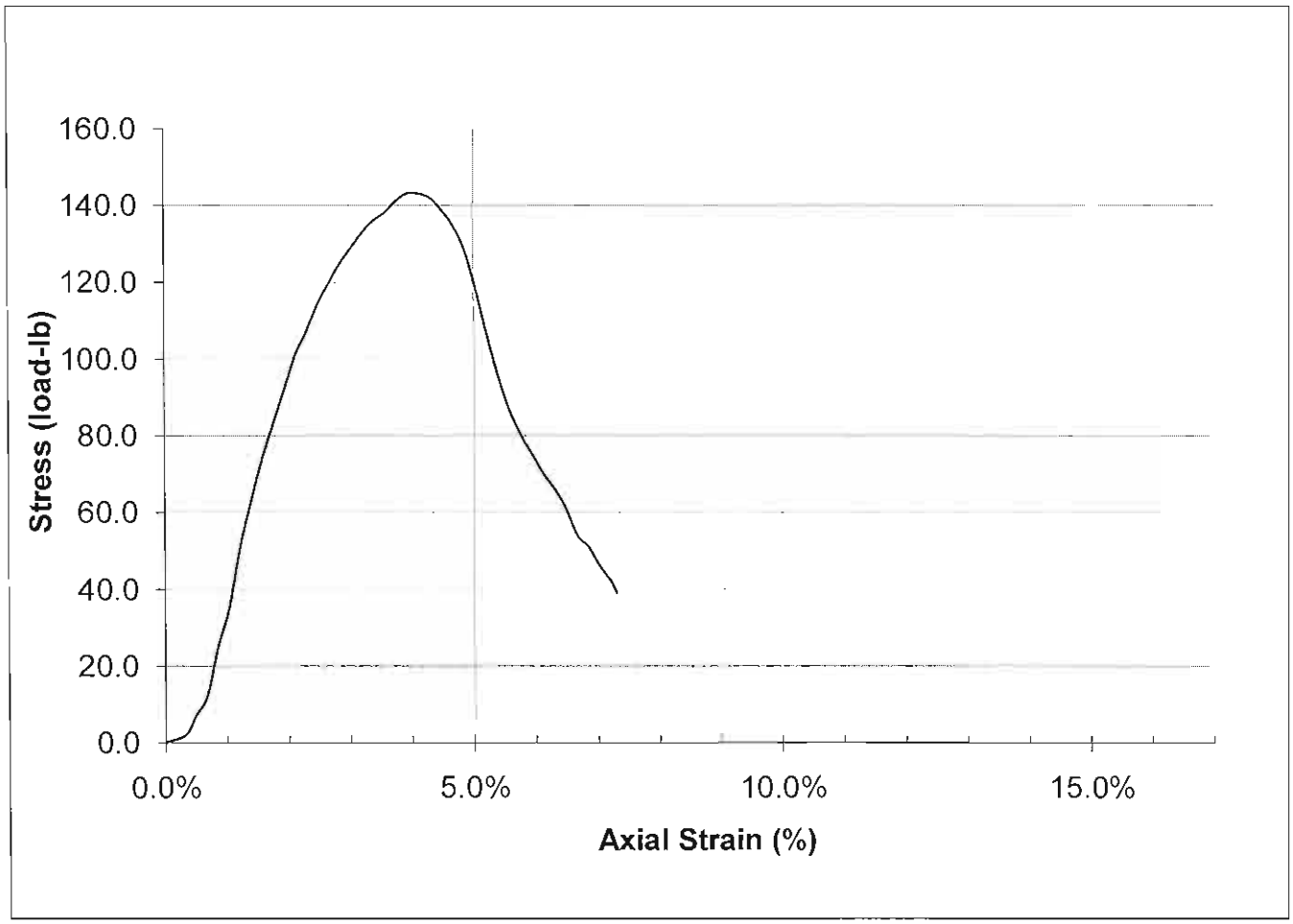
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.018	2	0.178	133	0.339	70		
0.027	7	0.188	136	0.349	66		
0.037	12	0.198	138	0.359	61		
0.047	25	0.208	141	0.369	54		
0.057	35	0.218	143	0.379	51		
0.067	51	0.228	143	0.389	46		
0.077	63	0.238	142	0.399	42		
0.087	74	0.248	139	0.404	39		
0.097	83	0.258	135				
0.107	92	0.268	129				
0.117	101	0.278	119				
0.127	107	0.288	107				
0.137	114	0.298	96				
0.148	120	0.308	87				
0.158	125	0.319	80				
0.168	129	0.329	75				

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B18-2c
Material Description
Lean CLAY with SAND, yellowish brown & brownish yellow, slightly cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	121.6
Dry Density (pcf)	99.3
% Moisture	22.5

Unconfined Compressive Strength (tsf)	2.19

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B22-2c Depth: 6.0-6.5'
Sample Description: SANDY SILT, pale brown, very fine-fine SAND, slightly cemented
Date: 11/13/2010
Tested By: MDR

Original Sample Length	5.300
Original Diameter (in)	2.420
Height-to-Diameter Ratio	2.2 : 1
Sample Area (in^2)	4.60

Test Results

Axial Strain at Max. Load	4.2%
Average cross-sectional area (in^2)	4.80
Deflection at Max. Load (in)	0.222
Maximum Load (lbs)	240
Strain at Failure (%)	1.18
Compressive Strength (tsf)	**3.60**

Moisture Density

Tube and Sample (g)	913.80
Tube (g)	178.40
Sample Weight (g)	735.40
Tare Number	N
Tare Weight (g)	238.80
Wet Weight (g)	660.10
Dry Weight (g)	592.10
Dry Weight (g)	353.30
Water Weight (g)	68.00
Percent Moisture (%)*	19.2
Wet Density (pcf)	114.9
Dry Density (pcf)	96.4

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

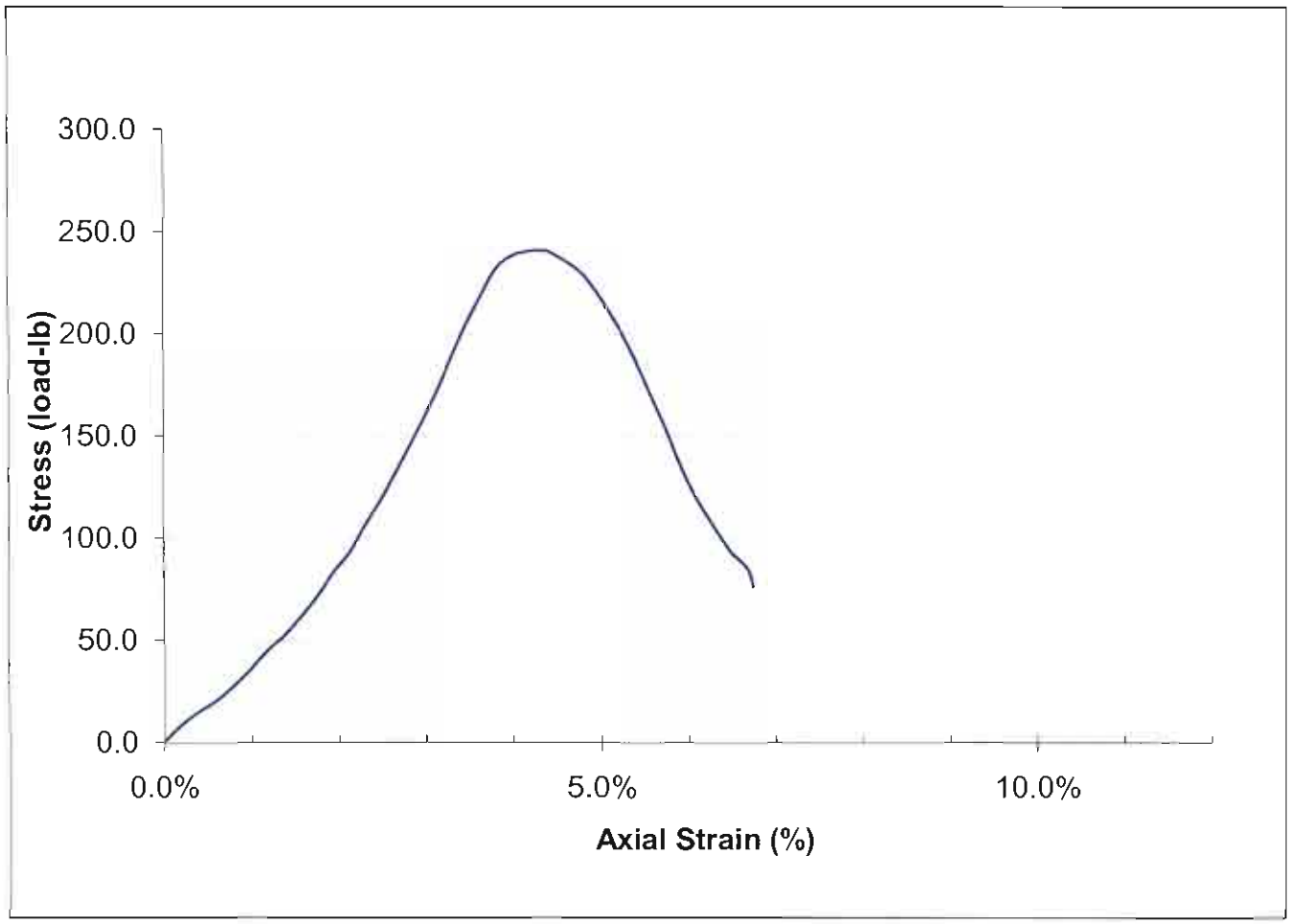
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.001	1	0.162	166	0.323	118		
0.011	9	0.172	184	0.333	105		
0.021	15	0.182	202	0.343	93		
0.031	20	0.192	218	0.353	85		
0.041	27	0.202	232	0.357	76		
0.051	35	0.212	238				
0.061	44	0.222	240				
0.072	52	0.232	240				
0.082	61	0.243	235				
0.092	71	0.253	229				
0.102	83	0.263	218				
0.112	93	0.273	205				
0.122	107	0.283	190				
0.132	120	0.293	172				
0.142	135	0.303	154				
0.152	150	0.313	134				

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B22-2c
Material Description
SANDY SILT, pale brown, very fine-fine SAND, slightly cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	114.9
Dry Density (pcf)	96.4
% Moisture	19.2

Unconfined Compressive Strength (tsf)	3.60

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B26-3c Depth: 11.0-11.5'
Sample Description: Lean CLAY with SAND, light yellowish brown and strong brown, mottled
Date: 11/13/2010
Tested By: MDR

Original Sample Length	5.970
Original Diameter (in)	2.425
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.62

Test Results

Axial Strain at Max. Load	1.9%
Average cross-sectional area (in^2)	4.71
Deflection at Max. Load (in)	0.111
Maximum Load (lbs)	148
Strain at Failure (%)	0.66
Compressive Strength (tsf)	**2.26**

Moisture Density

Tube and Sample (g)	888.70
Tube (g)	0.00
Sample Weight (g)	888.70
Tare Number	P
Tare Weight (g)	238.40
Wet Weight (g)	813.30
Dry Weight (g)	703.10
Dry Weight (g)	464.70
Water Weight (g)	110.20
Percent Moisture (%)*	23.7
Wet Density (pcf)	122.8
Dry Density (pcf)	99.2

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

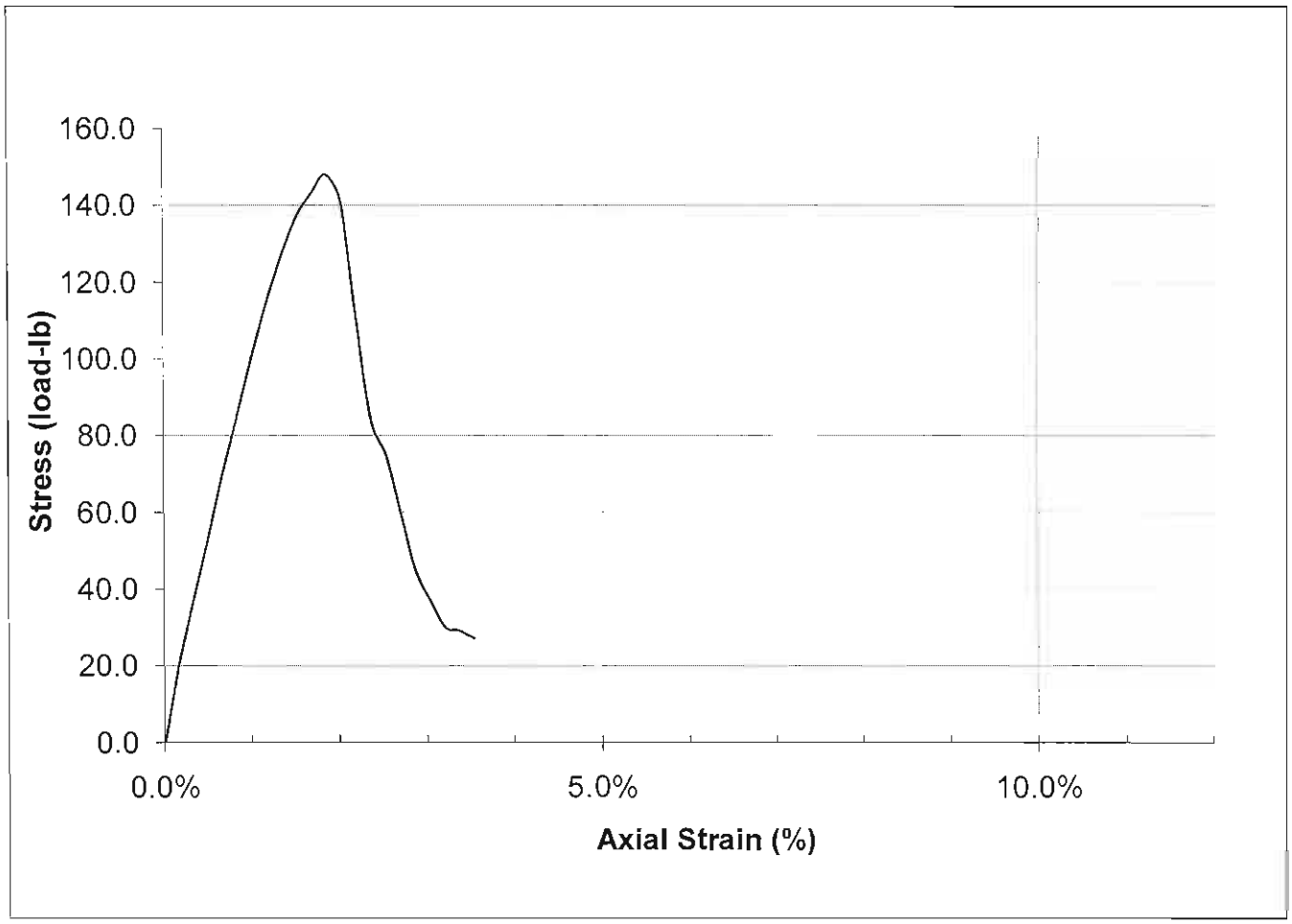
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.001	1	0.161	60				
0.010	20	0.171	45				
0.020	37	0.181	37				
0.030	53	0.191	30				
0.040	70	0.201	29				
0.050	85	0.211	27				
0.060	100						
0.070	114						
0.080	126						
0.091	137						
0.101	143						
0.111	148						
0.121	141						
0.131	111						
0.141	84						
0.151	75						

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B26-3c
Material Description
Lean CLAY with SAND, light yellowish brown and strong brown, mottled
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	122.8
Dry Density (pcf)	99.2
% Moisture	23.7

Unconfined Compressive Strength (tsf)	2.26

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B28-3c Depth: 11.0-11.5
Sample Description: SILTY CLAY, yellowish brown and olive brown, slightly cemented
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.485
Original Diameter (in)	2.398
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.52

Test Results

Axial Strain at Max. Load	5.5%
Average cross-sectional area (in^2)	4.78
Deflection at Max. Load (in)	0.303
Maximum Load (lbs)	200
Strain at Failure (%)	1.66
Compressive Strength (tsf)	**3.01**

Moisture Density

Tube and Sample (g)	802.50
Tube (g)	0.00
Sample Weight (g)	802.50
Tare Number	G2
Tare Weight (g)	179.40
Wet Weight (g)	581.50
Dry Weight (g)	504.10
Dry Weight (g)	324.70
Water Weight (g)	77.40
Percent Moisture (%)*	23.8
Wet Density (pcf)	123.4
Dry Density (pcf)	99.7

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

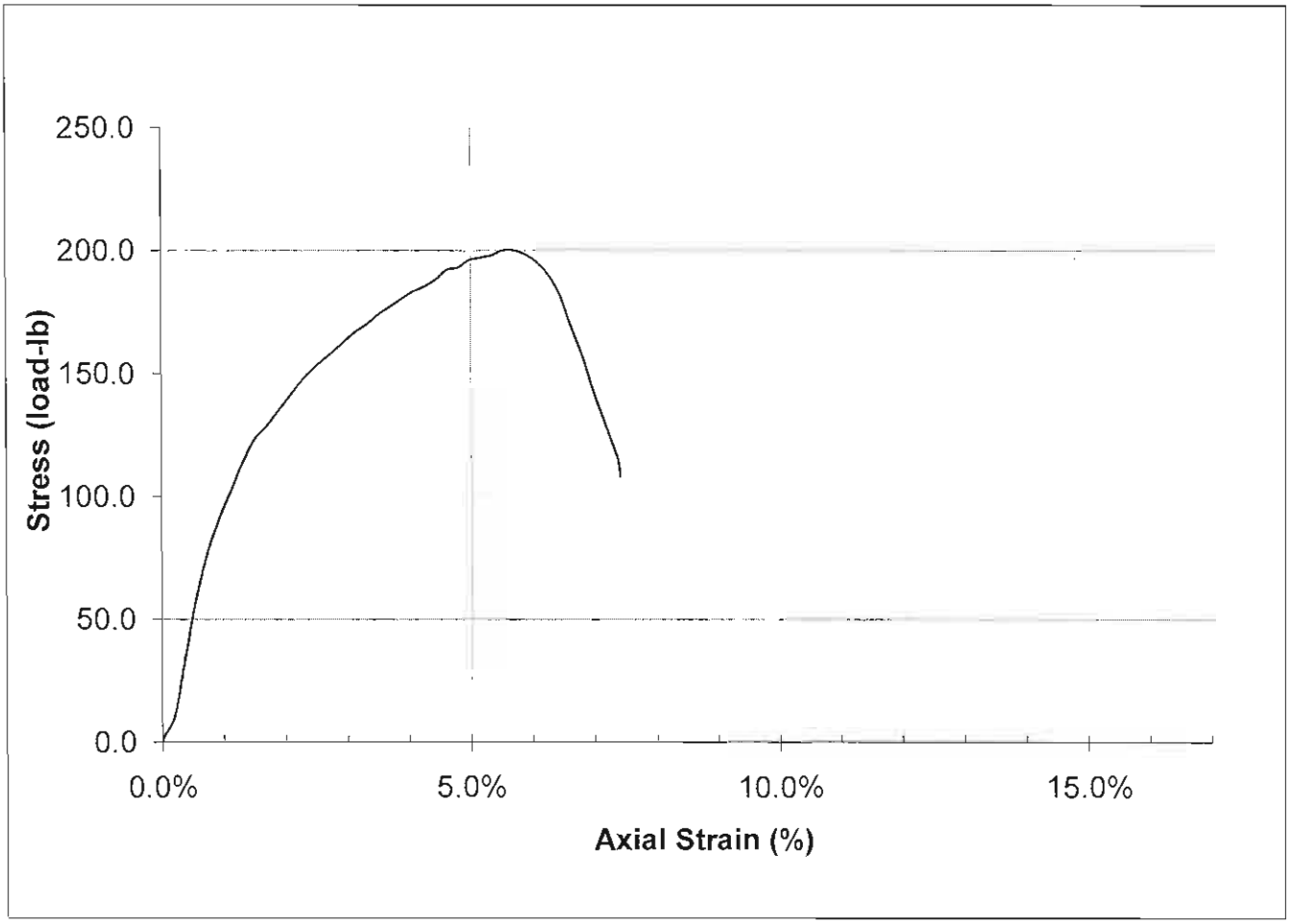
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.001	2	0.162	163	0.324	198		
0.011	11	0.172	167	0.333	195		
0.021	36	0.182	170	0.343	190		
0.031	60	0.192	174	0.353	182		
0.041	78	0.202	177	0.363	169		
0.051	91	0.212	180	0.373	157		
0.061	102	0.222	183	0.383	142		
0.072	114	0.232	185	0.393	129		
0.082	123	0.243	188	0.404	115		
0.092	128	0.253	192	0.406	108		
0.102	134	0.263	193				
0.112	140	0.273	196				
0.122	146	0.283	197				
0.132	151	0.293	198				
0.142	155	0.303	200				
0.152	159	0.313	200				

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B28-3c
Material Description
SILTY CLAY, yellowish brown and olive brown, slightly cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	123.4
Dry Density (pcf)	99.7
% Moisture	23.8

Unconfined Compressive Strength (tsf)	3.01

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipline
Project Number: 2049.1
Sample: B29-3c Depth: 11.0-11.5
Sample Description: Olive and orange brown SILT (slightly cemented)
Date: 10/29/2010
Tested By: MDR

Original Sample Length	5.676
Original Diameter (in)	2.406
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.55

Test Results

Axial Strain at Max. Load	3.2%
Average cross-sectional area (in^2)	4.70
Deflection at Max. Load (in)	0.182
Maximum Load (lbs)	161
Strain at Failure (%)	1.03
Compressive Strength (tsf)	**2.47**

Moisture Density

Tube and Sample (g)	824.40
Tube (g)	0.00
Sample Weight (g)	824.40
Tare Number	E5
Tare Weight (g)	177.10
Wet Weight (g)	616.80
Dry Weight (g)	547.40
Dry Weight (g)	370.30
Water Weight (g)	69.40
Percent Moisture (%)*	18.7
Wet Density (pcf)	121.7
Dry Density (pcf)	102.5

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

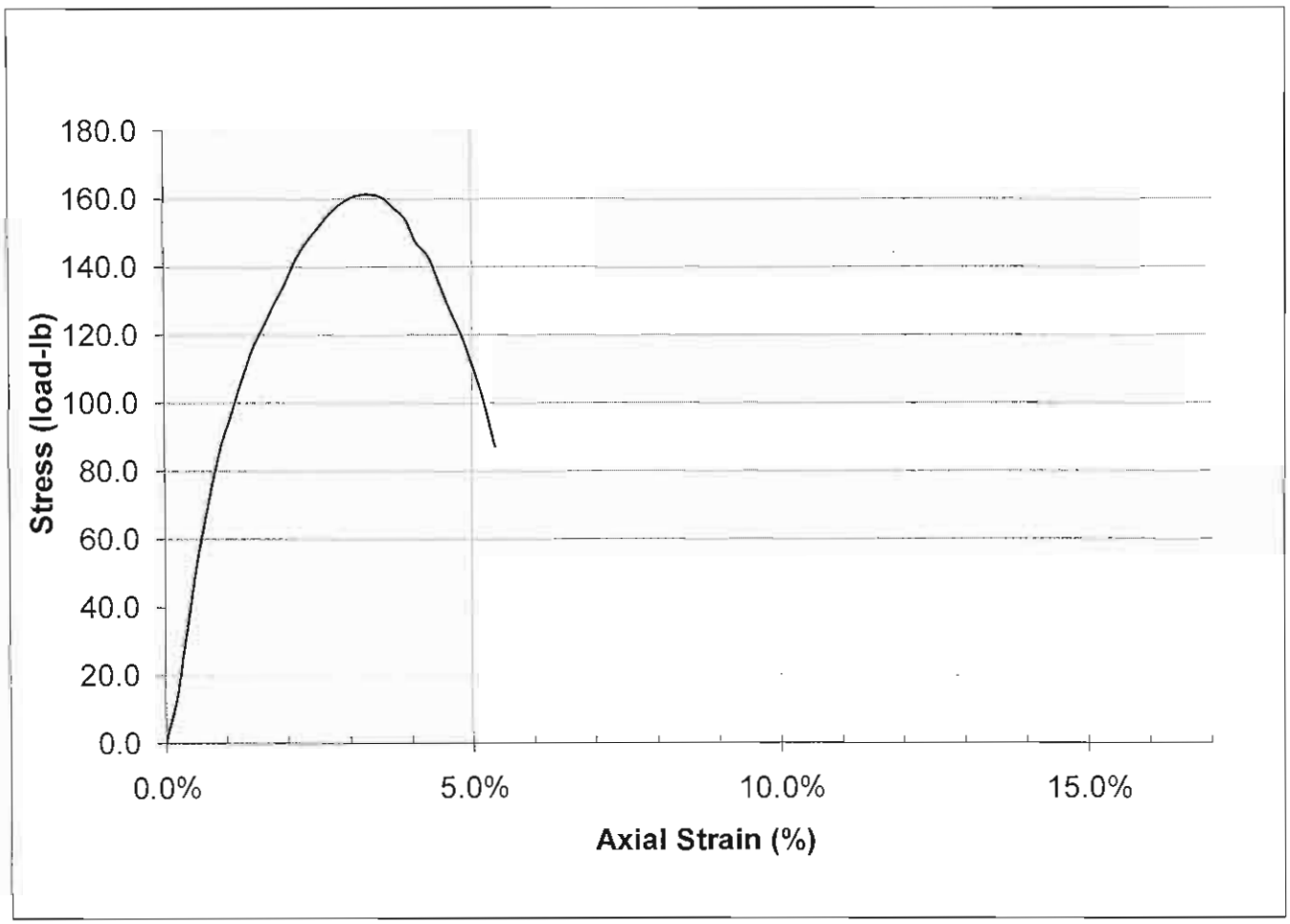
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.001	2	0.162	158				
0.011	15	0.172	160				
0.021	36	0.182	161				
0.031	56	0.192	161				
0.041	72	0.202	160				
0.051	86	0.212	157				
0.061	96	0.222	154				
0.072	107	0.232	147				
0.082	116	0.243	143				
0.093	123	0.253	135				
0.102	129	0.263	127				
0.112	135	0.273	120				
0.122	142	0.283	111				
0.132	147	0.293	101				
0.142	151	0.303	88				
0.152	155	0.304	87				

Project
Napa-Sonoma Pipline
Project Number
2049.1
Sample Number
B29-3c
Material Description
Olive and orange brown SILT (slightly cemented)
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	121.7
Dry Density (pcf)	102.5
% Moisture	18.7

Unconfined Compressive Strength (tsf)	2.47

Unconfined Compression Test
ASTM D 2166-06

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Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B32-2c Depth: 6.0-6.5'
Sample Description: SILTY CLAY with SAND, yellowish brown and light brownish gray
Date: 11/13/2010
Tested By: MDR

Original Sample Length	5.480
Original Diameter (in)	2.384
Height-to-Diameter Ratio	2.3 : 1
Sample Area (in^2)	4.46

Test Results

Axial Strain at Max. Load	1.6%
Average cross-sectional area (in^2)	4.54
Deflection at Max. Load (in)	0.089
Maximum Load (lbs)	89
Strain at Failure (%)	0.49
Compressive Strength (tsf)	**1.41**

Moisture Density

Tube and Sample (g)	789.90
Tube (g)	0.00
Sample Weight (g)	789.90
Tare Number	Q
Tare Weight (g)	240.70
Wet Weight (g)	692.90
Dry Weight (g)	609.80
Dry Weight (g)	369.10
Water Weight (g)	83.10
Percent Moisture (%)*	22.5
Wet Density (pcf)	123.0
Dry Density (pcf)	100.4

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

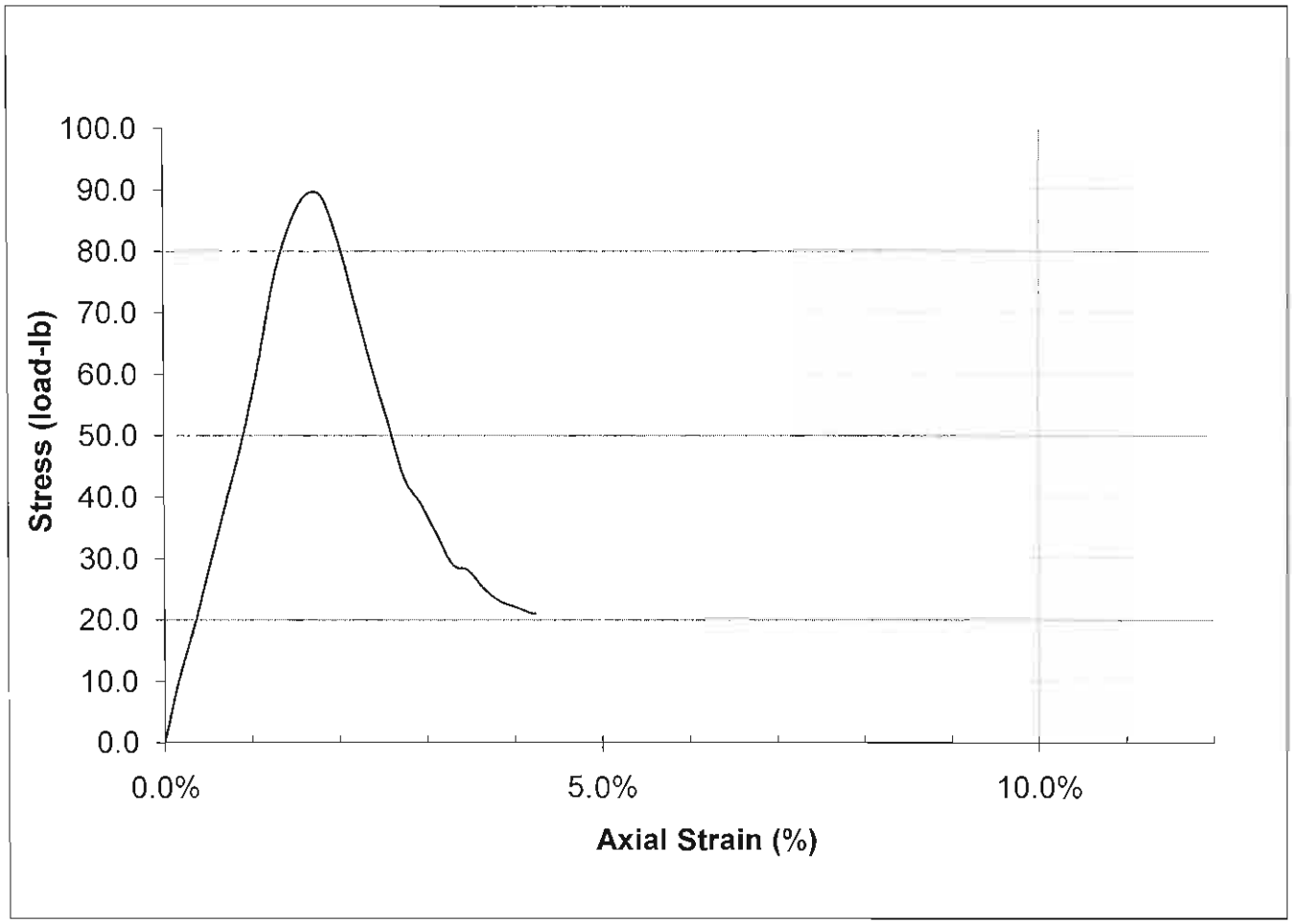
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.000	2	0.160	39				
0.009	10	0.170	34				
0.019	19	0.180	29				
0.029	29	0.190	28				
0.039	39	0.200	25				
0.049	49	0.210	23				
0.059	61	0.220	22				
0.069	75	0.230	21				
0.079	84	0.232	21				
0.089	89						
0.099	89						
0.110	81						
0.120	71						
0.130	61						
0.140	52						
0.150	43						

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B32-2c
Material Description
SILTY CLAY with SAND, yellowish brown and light brownish gray
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	123.0
Dry Density (pcf)	100.4
% Moisture	22.5

Unconfined Compressive Strength (tsf)	1.41

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipeline
Project Number: 2049.1
Sample: B35-3c Depth: 6.0-6.5'
Sample Description: Lean CLAY with SAND, dark yellowish brown, some fine GRAVEL
Date: 10/31/2010
Tested By: MDR

Original Sample Length	5.960
Original Diameter (in)	2.396
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.51

Test Results

Axial Strain at Max. Load	4.6%
Average cross-sectional area (in^2)	4.73
Deflection at Max. Load (in)	0.274
Maximum Load (lbs)	91
Strain at Failure (%)	1.63
Compressive Strength (tsf)	**1.39**

Moisture Density

Tube and Sample (g)	895.10
Tube (g)	0.00
Sample Weight (g)	895.10
Tare Number	G3
Tare Weight (g)	186.00
Wet Weight (g)	622.80
Dry Weight (g)	564.80
Dry Weight (g)	378.80
Water Weight (g)	58.00
Percent Moisture (%)*	15.3
Wet Density (pcf)	126.9
Dry Density (pcf)	110.0

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

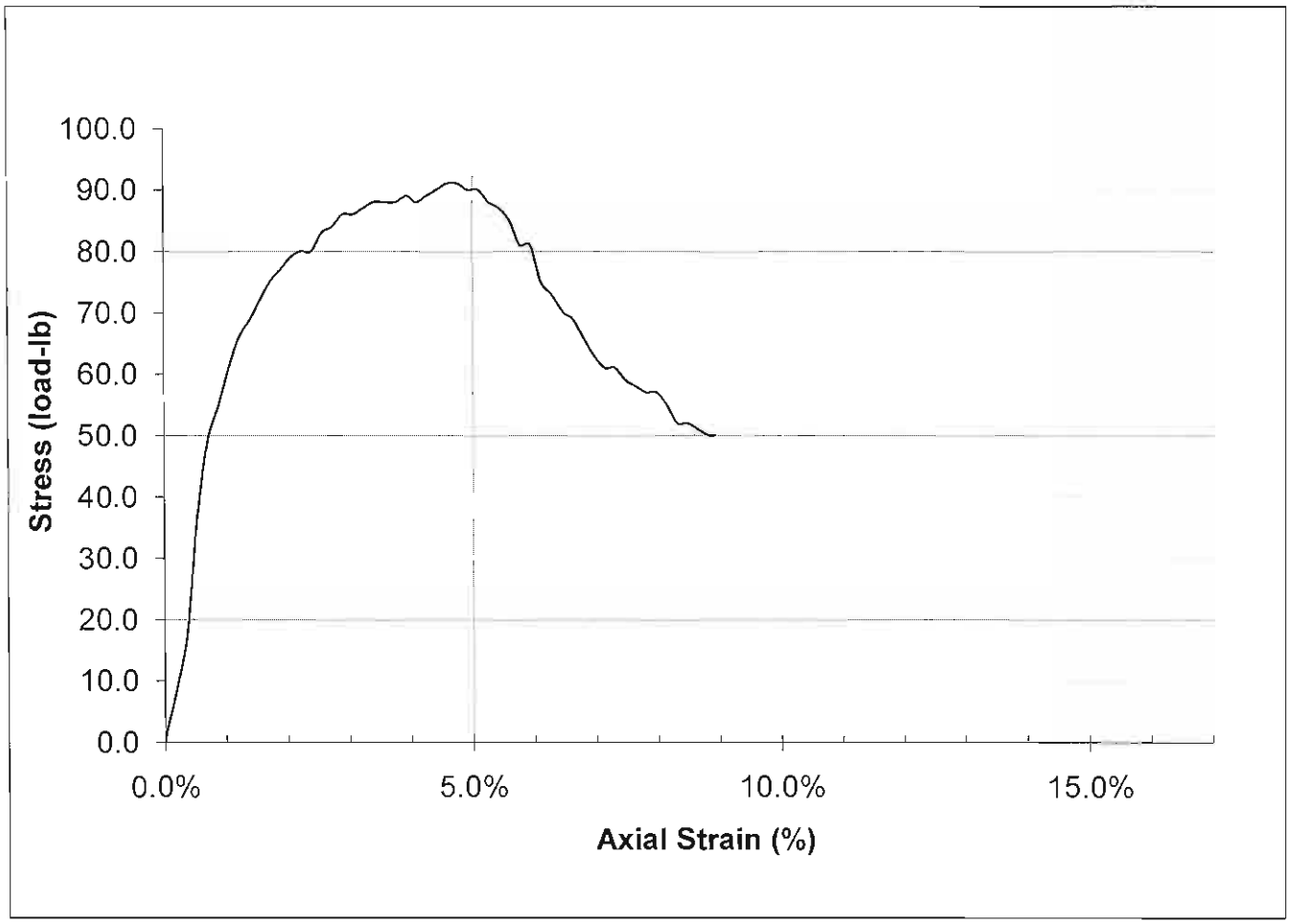
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.002	2	0.163	84	0.324	87	0.485	55
0.012	9	0.173	86	0.334	85	0.495	52
0.022	18	0.183	86	0.344	81	0.505	52
0.032	37	0.193	87	0.354	81	0.515	51
0.042	49	0.203	88	0.364	75	0.525	50
0.053	55	0.213	88	0.374	73	0.531	50
0.063	61	0.224	88	0.386	70		
0.073	66	0.235	89	0.395	69		
0.084	69	0.244	88	0.405	66		
0.093	72	0.254	89	0.415	63		
0.103	75	0.264	90	0.425	61		
0.113	77	0.274	91	0.435	61		
0.123	79	0.284	91	0.445	59		
0.133	80	0.294	90	0.455	58		
0.143	80	0.304	90	0.465	57		
0.153	83	0.314	88	0.475	57		

Project
Napa-Sonoma Pipeline
Project Number
2049.1
Sample Number
B35-3c
Material Description
Lean CLAY with SAND, dark yellowish brown, some fine GRAVEL
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	126.9
Dry Density (pcf)	110.0
% Moisture	15.3

Unconfined Compressive Strength (tsf)	1.39

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipline
Project Number: 2049.1
Sample: B37-3c Depth: 6.0-6.5'
Sample Description: Fat CLAY (CH), pale olive, slightly cemented
Date: 4/9/2011
Tested By: MDR

Original Sample Length	5.985
Original Diameter (in)	2.403
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.54

Test Results

Axial Strain at Max. Load	2.9%
Average cross-sectional area (in^2)	4.67
Deflection at Max. Load (in)	0.173
Maximum Load (lbs)	77
Strain at Failure (%)	1.04
Compressive Strength (tsf)	**1.19**

Moisture Density

Tube and Sample (g)	828.99
Tube (g)	0.00
Sample Weight (g)	828.99
Tare Number	J7
Tare Weight (g)	190.11
Wet Weight (g)	701.04
Dry Weight (g)	576.62
Dry Weight (g)	386.51
Water Weight (g)	124.42
Percent Moisture (%)*	32.2
Wet Density (pcf)	116.3
Dry Density (pcf)	88.0

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

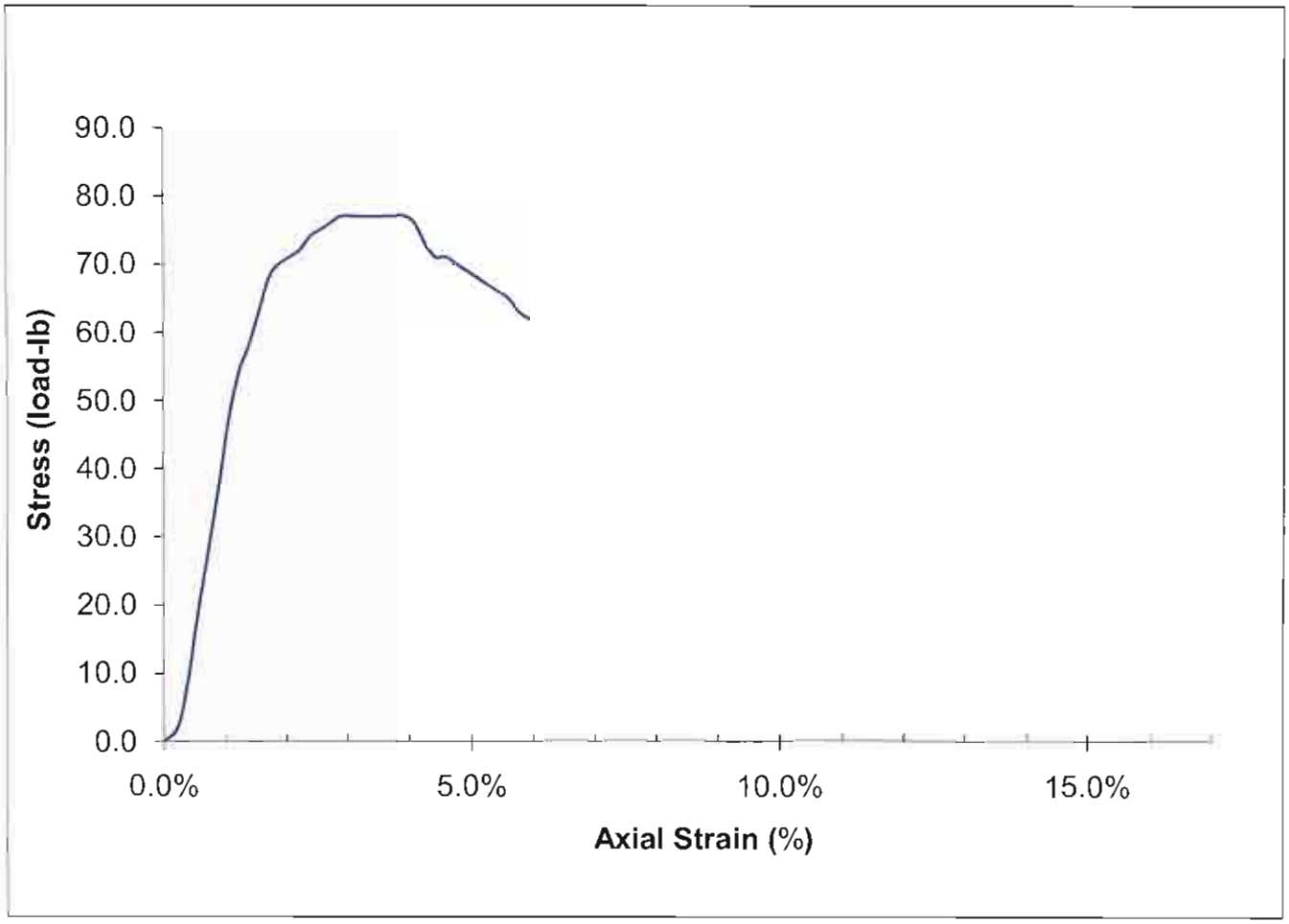
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.013	2	0.173	77	0.334	65		
0.022	8	0.183	77	0.344	63		
0.032	18	0.193	77	0.354	62		
0.042	27	0.203	77	0.364	63		
0.053	37	0.213	77	0.370	63		
0.063	47	0.224	77				
0.073	54	0.234	77				
0.083	58	0.244	76				
0.093	63	0.254	73				
0.103	68	0.264	71				
0.113	70	0.274	71				
0.123	71	0.284	70				
0.133	72	0.294	69				
0.143	74	0.304	68				
0.153	75	0.314	67				
0.163	76	0.324	66				

Project
Napa-Sonoma Pipline
Project Number
2049.1
Sample Number
B37-3c
Material Description
Fat CLAY (CH), pale olive, slightly cemented
Tested By
MDR

ASTM D 2166-06



Wet Density (pcf)	116.3
Dry Density (pcf)	88.0
% Moisture	32.2

Unconfined Compressive Strength (tsf)	1.19

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: Napa-Sonoma Pipline
Project Number: 2049.1
Sample: B37-4c Depth: 11.0-11.5'
Sample Description: Lean CLAY with SAND (CL), pale olive and olive, slightly cemented
Date: 4/9/2011
Tested By: MDR

Original Sample Length	5.911
Original Diameter (in)	2.416
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.58

Test Results

Axial Strain at Max. Load	7.7%
Average cross-sectional area (in^2)	4.97
Deflection at Max. Load (in)	0.457
Maximum Load (lbs)	199
Strain at Failure (%)	2.70
Compressive Strength (tsf)	**2.88**

Moisture Density

Tube and Sample (g)	897.14
Tube (g)	0.00
Sample Weight (g)	897.14
Tare Number	G1
Tare Weight (g)	191.36
Wet Weight (g)	649.12
Dry Weight (g)	565.14
Dry Weight (g)	373.78
Water Weight (g)	83.98
Percent Moisture (%)*	22.5
Wet Density (pcf)	126.1
Dry Density (pcf)	103.0

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

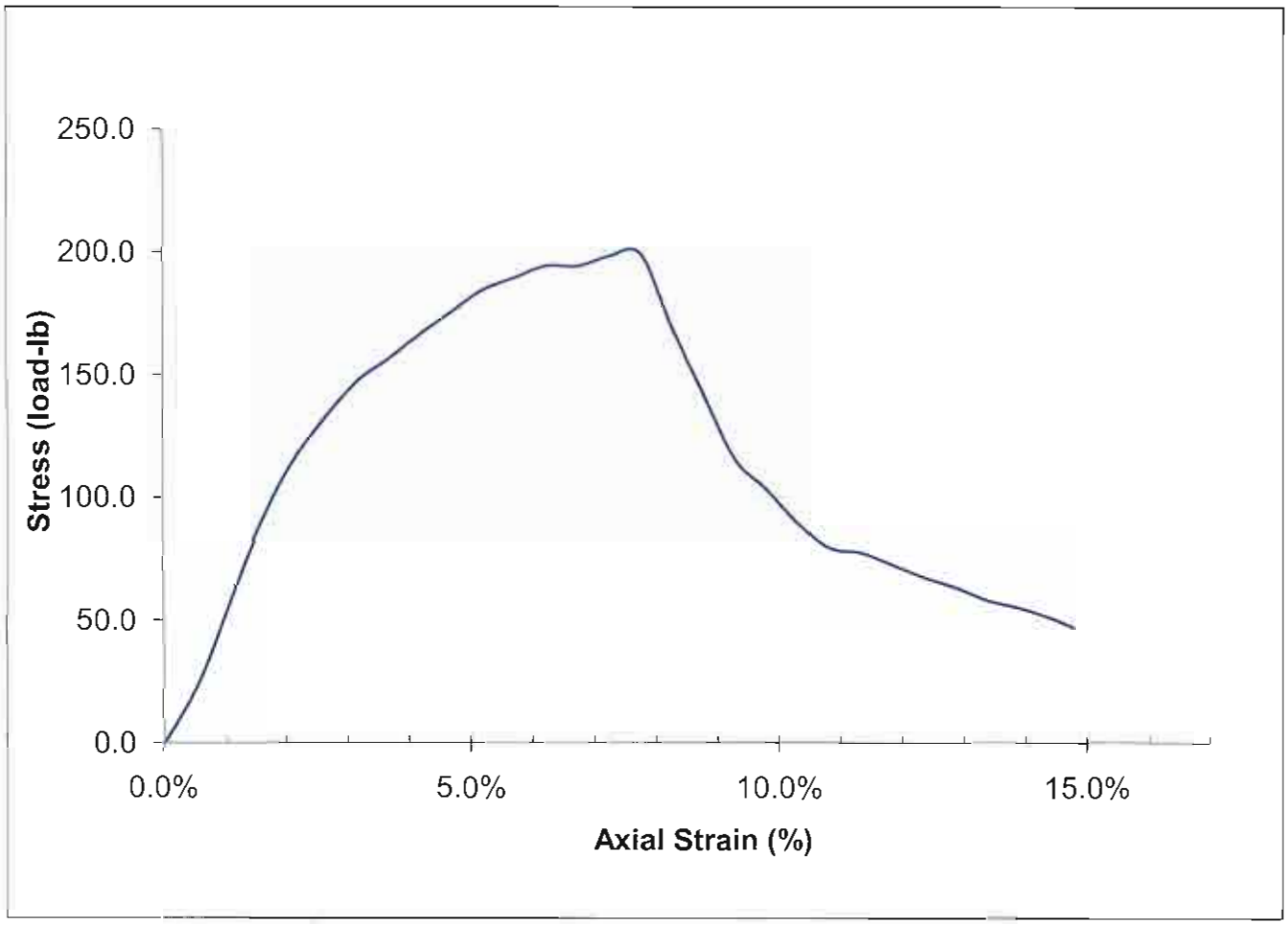
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.004	2	0.487	169				
0.035	26	0.518	141				
0.065	60	0.548	115				
0.095	91	0.578	103				
0.125	115	0.608	89				
0.155	132	0.638	79				
0.186	147	0.668	77				
0.216	156	0.699	72				
0.246	166	0.729	67				
0.276	175	0.759	63				
0.306	184	0.789	58				
0.336	189	0.819	55				
0.367	194	0.849	51				
0.397	194	0.872	47				
0.427	198						
0.457	199						

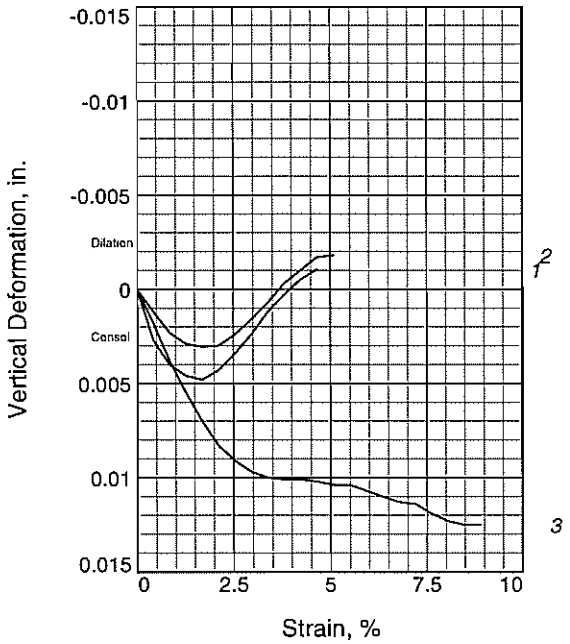
Project
Napa-Sonoma Pipline
Project Number
2049.1
Sample Number
B37-4c
Material Description
Lean CLAY with SAND (CL), pale olive and olive, slightly cemented
Tested By
MDR

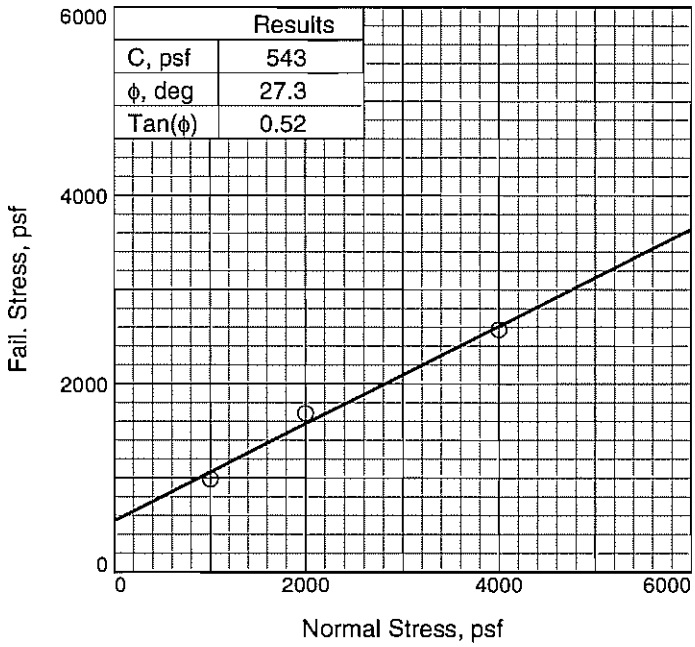
ASTM D 2166-06

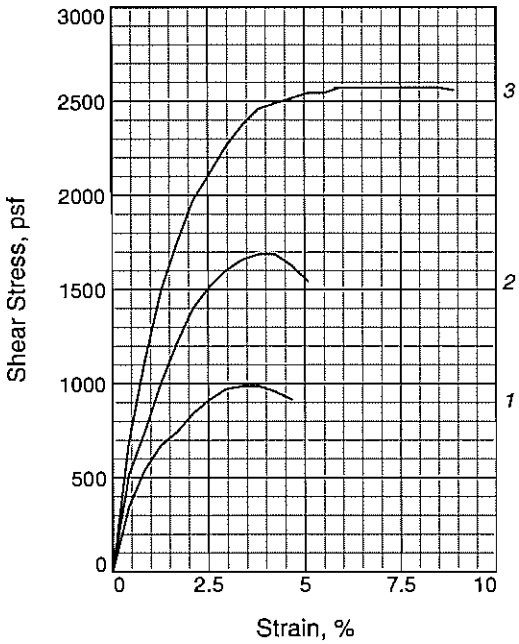


Wet Density (pcf)	126.1
Dry Density (pcf)	103.0
% Moisture	22.5

Unconfined Compressive Strength (tsf)	2.88







Sample No.		1	2	3
Initial	Water Content, %	32.0	34.5	34.3
	Dry Density, pcf	89.9	86.9	87.0
	Saturation, %	98.8	99.0	98.8
	Void Ratio	0.8752	0.9400	0.9369
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.94	0.94
At Test	Water Content, %	31.2	33.0	28.8
	Dry Density, pcf	91.4	89.1	94.9
	Saturation, %	99.7	100.0	100.0
	Void Ratio	0.8451	0.8918	0.7769
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.93	0.92	0.87
Normal Stress, psf		1000	2000	4000
Fail. Stress, psf		986	1687	2573
Strain, %		3.4	3.8	5.9
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: undisturbed
Description: Olive Brown Clayey SAND

Assumed Specific Gravity= 2.70
Remarks:

Figure _____

Client: CDM

Project: Napa - Sonoma Pipeline

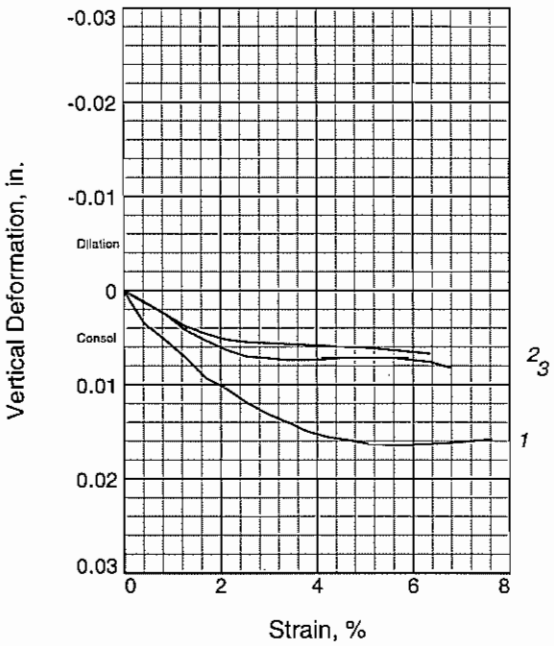
Sample Number: B4-3C **Depth:** 11.0'-11.5'

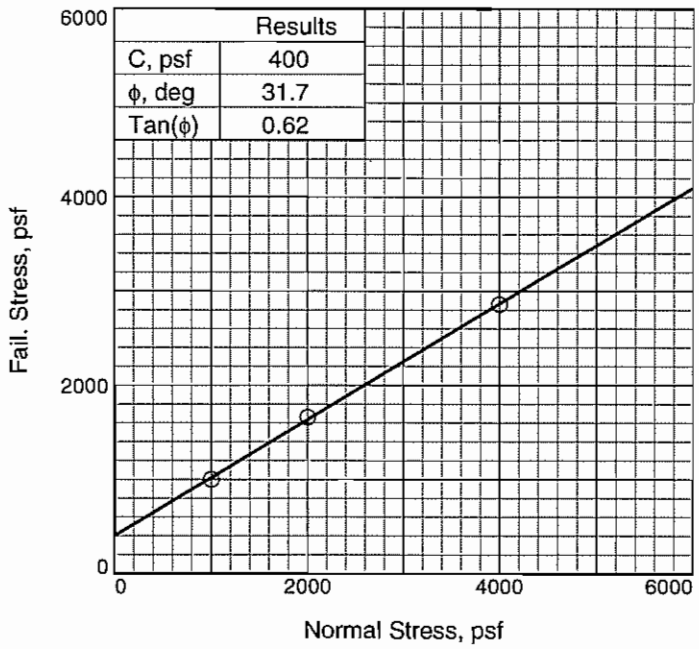
Proj. No.: 2049.1 **Date Sampled:**

DIRECT SHEAR TEST REPORT

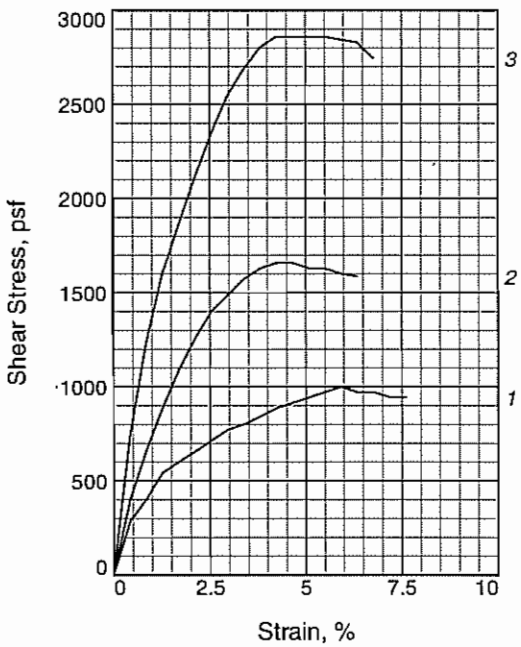
Blackburn Consulting

Tested By: KLC **Checked By:** KLC





Results	
C, psf	400
ϕ, deg	31.7
Tan(ϕ)	0.62



	Sample No.	1	2	3
Initial	Water Content, %	27.4	26.3	27.1
	Dry Density, pcf	88.2	94.5	92.8
	Saturation, %	81.3	90.5	89.6
	Void Ratio	0.9104	0.7839	0.8157
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.94	0.94
At Test	Water Content, %	30.0	26.5	25.0
	Dry Density, pcf	91.5	98.2	100.7
	Saturation, %	96.2	99.9	100.0
	Void Ratio	0.8431	0.7162	0.6741
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.91	0.91	0.87
Normal Stress, psf		1000	2000	4000
Fail. Stress, psf		1001	1658	2859
Strain, %		5.9	4.2	4.2
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.09	0.09	0.09

Sample Type: undisturbed
Description: Dark Yellowish Brown Sandy SILT

Assumed Specific Gravity= 2.70
Remarks:

Figure _____

Client: CDM

Project: Napa - Sonoma Pipeline

Sample Number: B5-4C **Depth:** 11.0'-11.5'

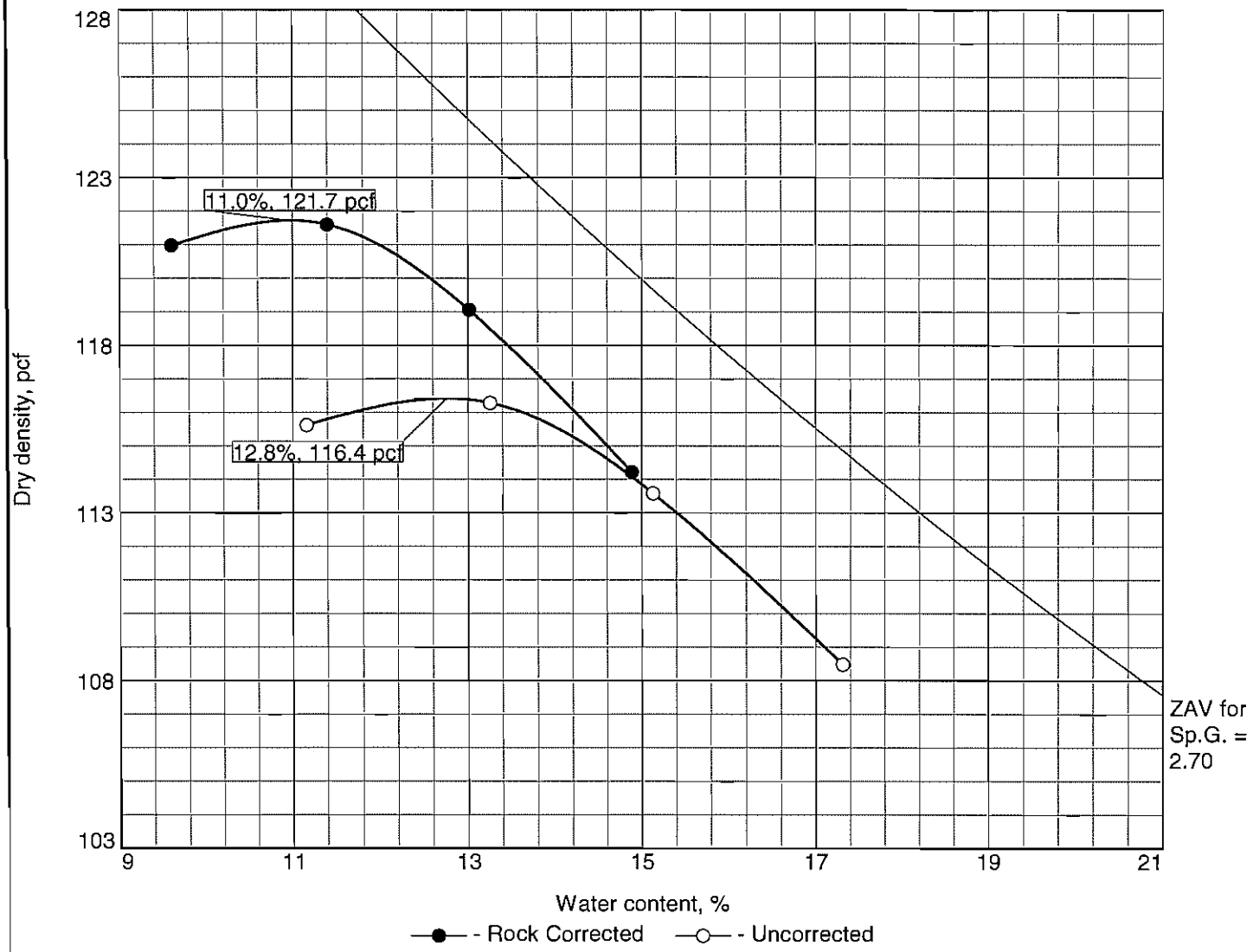
Proj. No.: 2049.1 **Date Sampled:**

DIRECT SHEAR TEST REPORT

Blackburn Consulting

Tested By: KLC **Checked By:** KLC

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method A Modified
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
1.5'-3.0'	SC	A-4(2)		2.70	29	10	14.1	49.6

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 121.7 pcf	116.4 pcf	Dark Brown Clayey SAND
Optimum moisture = 11.0 %	12.8 %	

Project No. 2049.1 **Client:** CDM
Project: Napa - Sonoma Pipeline

○ **Depth:** 1.5'-3.0' **Sample Number:** B1-1 & B5-1 Combined

Remarks:

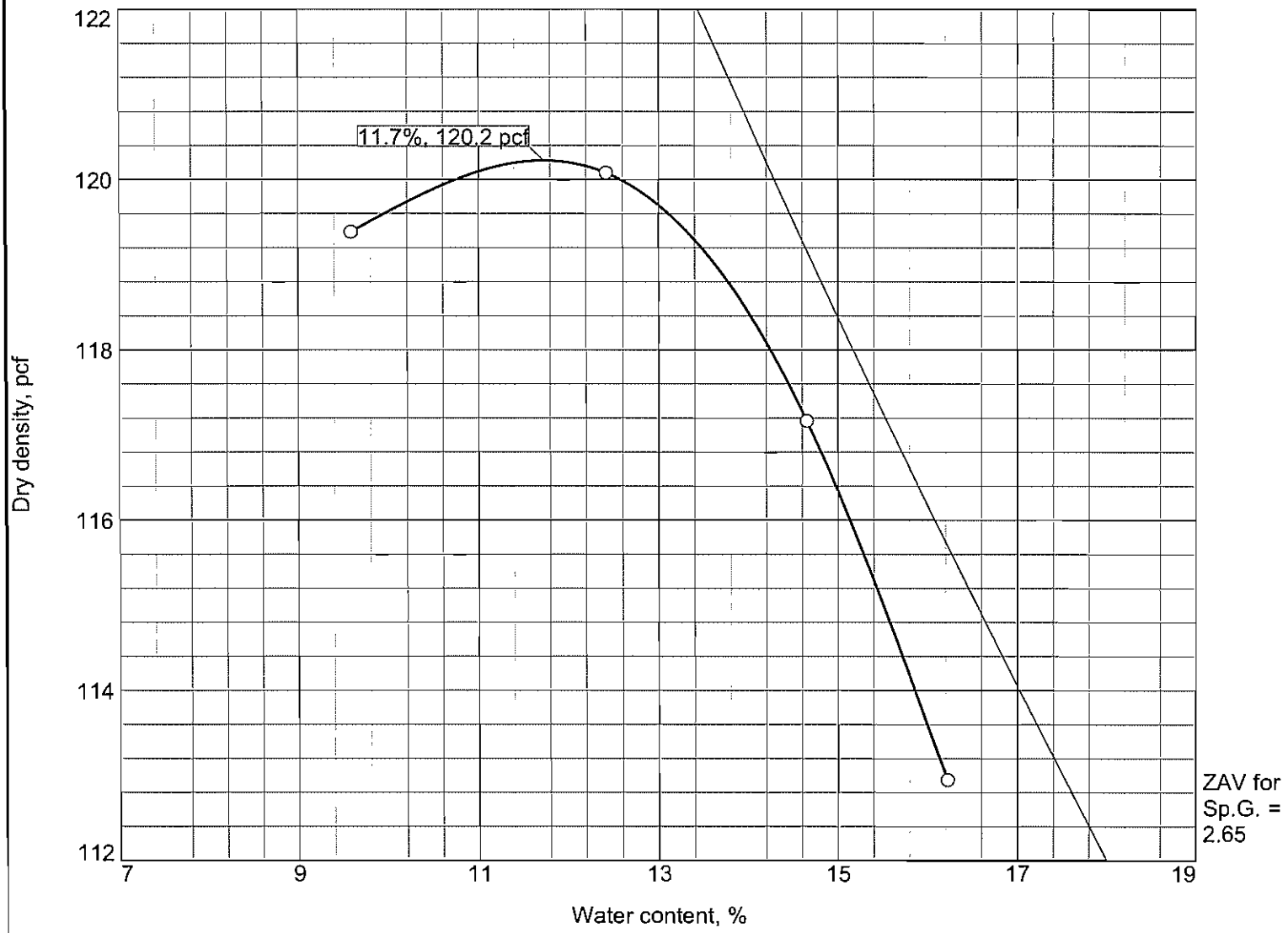
Blackburn Consulting

Auburn, CA

Figure

Tested By: KLC **Checked By:** KLC

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method B Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.5-4.5'	CL			2.65	35	21	0.1	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 120.2 pcf Optimum moisture = 11.7 %	Lean CLAY, dark grayish brown/pale brown

Project No. 2049.1 **Client:** CDM
Project: Napa-Sonoma Pipeline

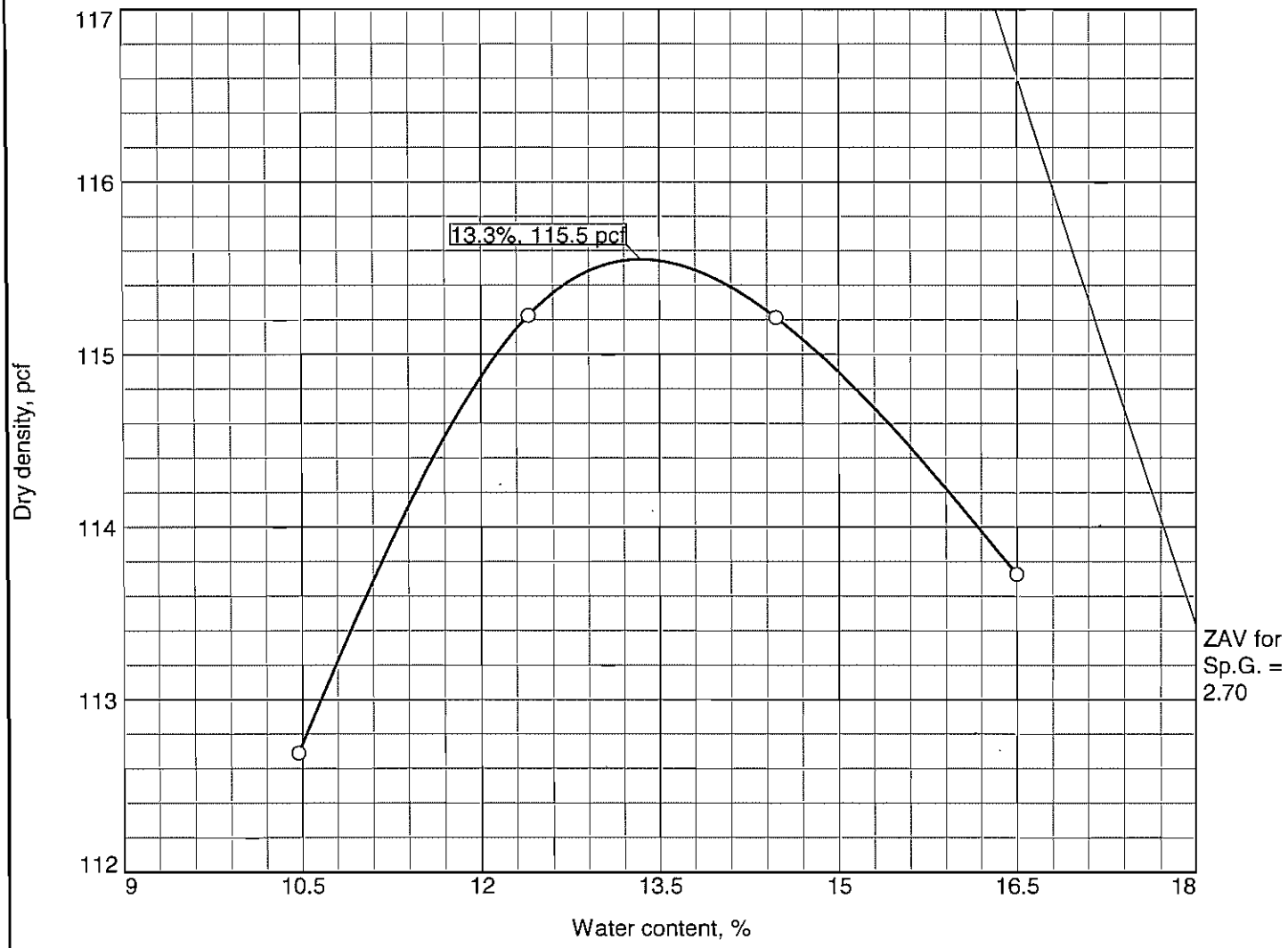
○ **Sample Source:** Composite B12 & B14 **Depth:** 1.5-4.5' **Sample No.:** 1

Remarks:

Blackburn Consulting

W. Sacramento, CA

COMPACTION TEST REPORT



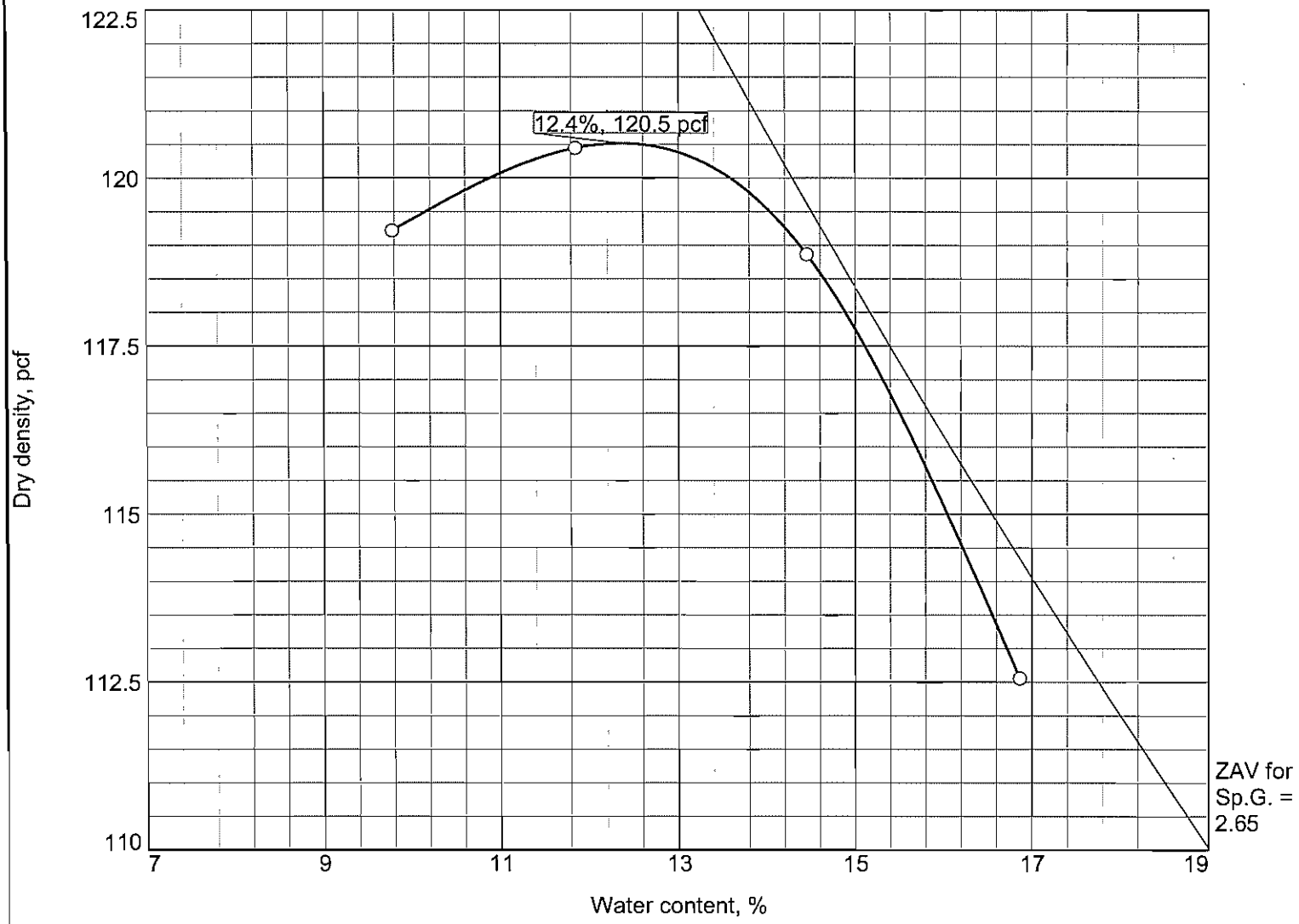
Test specification: ASTM D 1557-07 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
1.5'-4.5'				2.70			4.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 115.5 pcf Optimum moisture = 13.3 %	Yellowish Brown Lean CLAY
Project No. 2049.1 **Client:** CDM **Project:** Napa - Sonoma Pipeline ○ **Depth:** 1.5'-4.5' **Sample Number:** B25-1 & B27-1	**Remarks:**
Blackburn Consulting **Auburn, CA**	**Figure**

Tested By: KLC **Checked By:** KLC

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method B Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.5-4.5'	CL	A-7-6(13)		2.65	42	25	6.9	63.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 120.5 pcf Optimum moisture = 12.4 %	Fat CLAY and SILTY CLAY with SAND, trace GRAVEL, dark grayish brown and very dark gray

Project No. 2049.1 **Client:** CDM
Project: Napa-Sonoma Pipeline

○ **Sample Source:** Composite B31 & B35 **Depth:** 1.5-4.5' **Sample No.:** 1

Remarks:

Blackburn Consulting

W. Sacramento, CA

BSK Associates
Engineers & Laboratories

567 West Shaw Avenue Suite B
Fresno CA 93704
P 559.497.2880
F 559.497.2886
www.bskassociates.com

VIA US MAIL

November 10, 2010

BSK Job G1008510F
BSK SAMPLE ID: F10-628

Mr. Mark Robertson
Blackburn Consulting
2491 Boatman Avenue
West Sacramento, CA 95691

SUBJECT: Laboratory Testing Results
PO 10071 – Napa-Sonoma Pipeline
Sample Date: Various (9/30 through 10/06/10)

Dear Mr. Robertson:

BSK has performed testing on six (6) samples shipped to our laboratory. Testing was performed in accordance with Caltrans Test Methods and consisted of Minimum Resistivity and pH (Caltrans Test Method 643), Sulfate Content (Caltrans Test Method 417), and Chloride Content (Caltrans Test Method 422). The results are tabulated below and the test reports are enclosed.

Sample ID	Minimum Resistivity, Ohm-cm @ 15.5°C	pH	Sulfate, mg/kg	Chloride, mg/kg
Composite: B7-4B & B7-4C	260	7.4 @ 22.6°C	310	1700
Composite: B11-2B & B11-2C	1,170	7.6 @ 22.8°C	12	27
Composite: B17-3B & B17-3C	1,040	8.6 @ 22.7°C	92	110
Bulk: B21-1	820	5.6 @ 22.6°C	49	110
Composite: B29-2B & B29-2C	500	6.2 @ 22.6°C	17	270
Composite: B34-2B & B34-2C	1,170	5.3 @ 22.7°C	30	30

BSK appreciates the opportunity to be of service to Blackburn Consulting and looks forward to being of service to you in the future. Please call with any questions you may have @ 559-497-2870.

Respectfully,
BSK Associates

Nathan M. Shwiyhat, P.E.
Project Engineer

Enclosures: Minimum Resistivity Test Reports
Analytical Results

Distribution: Client (1 original, 1 E-Copy)
Mr. Mike Robertson, Blackburn Consulting (1 E-Copy)
BSK File

BSK Associates
Engineers & Laboratories

567 West Shaw Avenue Suite B
Fresno CA 93704
P 559.497.2880
F 559.497.2886
www.bskassociates.com

VIA US MAIL

November 18, 2010

BSK Job G1008510F
BSK SAMPLE ID: F10-628
Sample Receipt Date: 11/10/10

Mr. Ken Colburn
Blackburn Consulting
11521 Blocker Drive, Suite 110
Auburn, CA 95603

SUBJECT: Laboratory Testing Results
PO 10078 – Napa-Sonoma Pipeline
Sample Date: Various (11/2 through 11/03/10)

Dear Mr. Colburn:

BSK has performed testing on three (3) samples shipped to our laboratory. Testing was performed in accordance with Caltrans Test Methods and consisted of Minimum Resistivity and pH (Caltrans Test Method 643), Sulfate Content (Caltrans Test Method 417), and Chloride Content (Caltrans Test Method 422). The results are tabulated below and the test reports are enclosed.

Sample ID	Minimum Resistivity, Ohm-cm @ 15.5°C	pH	Sulfate, mg/kg	Chloride, mg/kg
B2-3C @ 11.0' – 11.5'	1,170	7.6 @ 19.6°C	10	21
B4-3B @ 10.5' – 11.0'	1,860	8.1 @ 19.6°C	7.4	26
B5-3B @ 5.5' – 6.0'	1,070	6.4 @ 19.6°C	11	53

BSK appreciates the opportunity to be of service to Blackburn Consulting and looks forward to being of service to you in the future. Please call with any questions you may have @ 559-497-2870.

Respectfully,
BSK Associates

Nathan M. Shwiyhat, P.E.
Project Engineer

Enclosures: Minimum Resistivity Test Reports
Analytical Results

Distribution: Client (1 original, 1 E-Copy)
BSK File

11521 Blocker Drive, Suite 110
Auburn, CA 95603

blackburn consulting

(530) 887-1494
fax: (530) 887-1495

Minimum Resistivity and pH Test Results

File No.: 2049.1
Date: 4/13/2011

Project Name: Napa Sonoma Pipeline

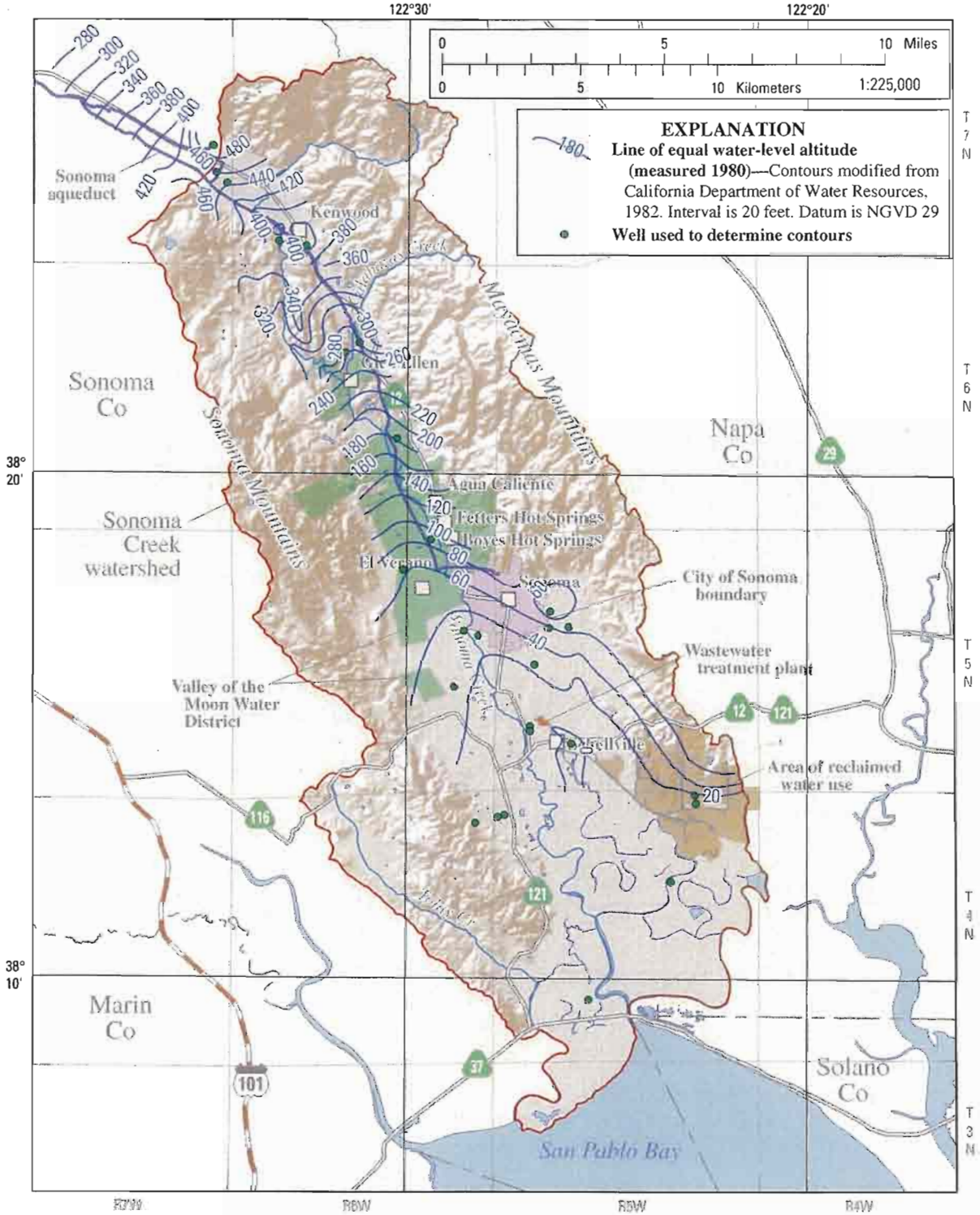
Sample ID	Minimum Resistivity, Ohm-cm @ 15.5° C	pH
B37-1	674	7.36 @ 20.6° C

Minimum Resistivity and pH performed based on Caltrans Test Method 643

APPENDIX E

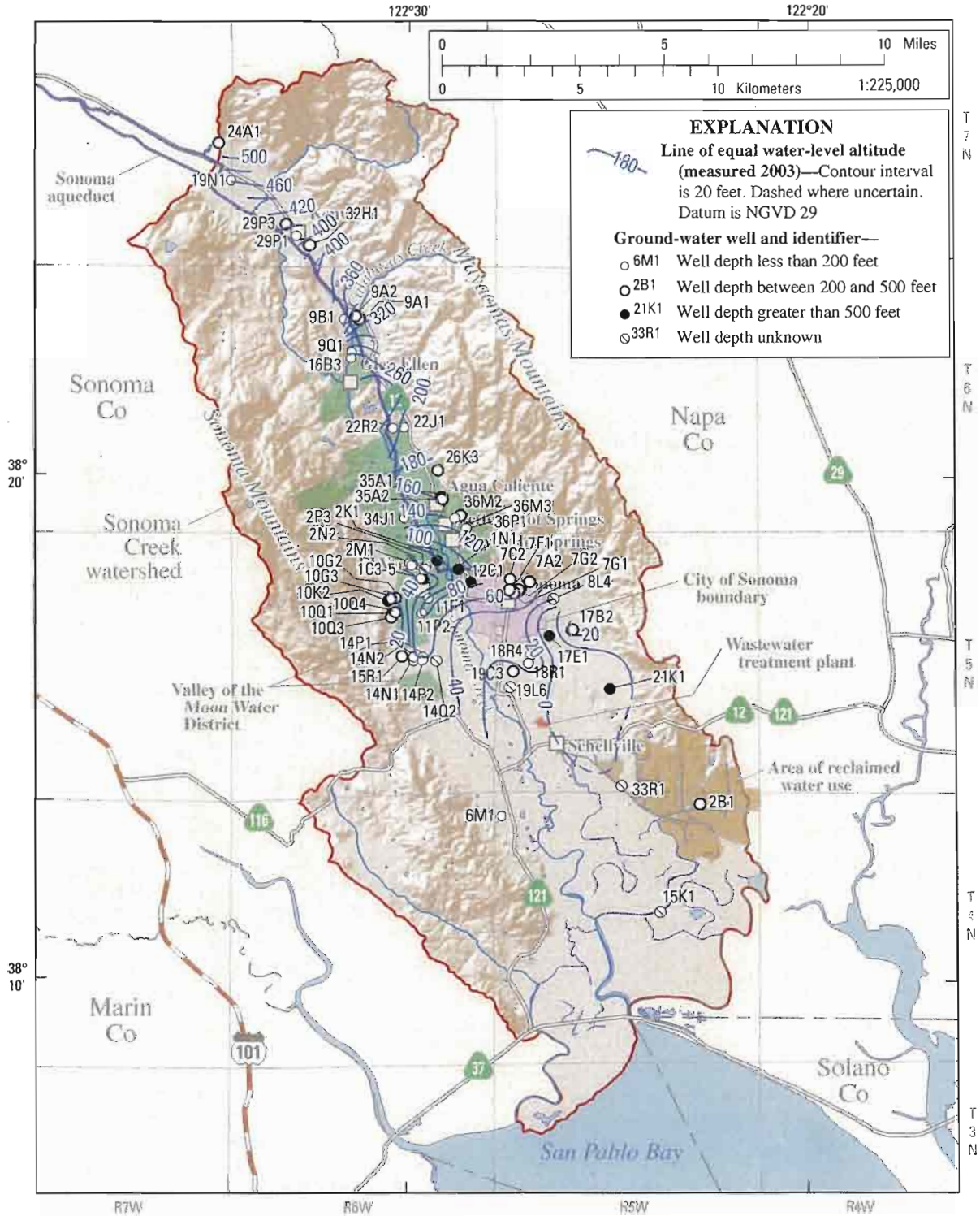
Groundwater Elevation Maps

Sonoma Valley, USGS (2006), 1980 and 2003 water levels



Base from U.S. Geological Survey digital data, 1:250,000, 2003. State Plane Projection, Fipzone 402
Shaded relief base from 1:250,000 scale Digital Elevation Model: sun illumination from northwest at 30 degrees above horizon

Figure 17. Autumn 1980 water levels in Sonoma Valley, Sonoma County, California.



Base from U.S. Geological Survey digital data, 1:250,000, 2003. State Plane Projection, Fipzone 402
Shaded relief base from 1:250,000 scale Digital Elevation Model: sun illumination from northwest at 30 degrees above horizon

Figure 18. Spring 2003 water levels in Sonoma Valley, Sonoma County, California.