GEOTECHNICAL DESIGN REPORT
SR 32 Widening Project

03-But-32
From SR 99 to Yosemite Drive
MP 10.14/12.65
EA: 1E-4900

Prepared by:

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October 29, 2010

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Geotechnical ▪ Construction Services ▪ Forensics

File No. 1202.2
October 29, 2010

Mr. Matt Brogan
Mark Thomas & Company, Inc.
7300 Folsom Boulevard, Suite 203
Sacramento, CA 95826

Subject: **GEOTECHNICAL DESIGN REPORT**
SR 32 Widening Project, 03-But-32
SR 99 to Yosemite Drive, MP 10.14/12.65
EA: 1E-4900
Chico, California

Dear Mr. Brogan,

Blackburn Consulting (BCI) is pleased to submit this Geotechnical Design Report for the SR 32 Widening Project in Chico, California. BCI prepared this report in accordance with our June 5, 2009 agreement. This report describes the geotechnical and material conditions as evaluated from our field and laboratory test data, and provides geotechnical recommendations and specifications for design and construction of the project earthwork and grading elements.

Recommendations for pavement and culvert design are included in a separate Materials Report. Recommendations for bridge foundations at the Dead Horse Slough widening are included in a separate Foundation Report.

Thank you for selecting BCI to be on your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

Robert Pickard, C.E.G.
Project Engineering Geologist

Rick Sowers, P.E.
Principal

GEOTECHNICAL DESIGN REPORT

SR 32 Widening Project, 03-But-32

SR 99 to Yosemite Drive, MP 10.14/12.65, EA: 1E-4900

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1 INTRODUCTION

1.1 Purpose

BCI prepared this Geotechnical Design Report for the State Route 32 (SR 32) widening project from SR99 (MP 10.14, approximate Station 92) to about 1,400 ft east of Yosemite Drive (MP 12.65, approximate Station 224), a distance of about 2.5 miles. We show the project area on Figure 1.

The purpose of this report is to document subsurface geotechnical conditions and provide geotechnical recommendations for design and construction of the roadway and earthwork elements of the project. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions.

1.2 Scope of Services

To prepare this report, BCI:

- Reviewed preliminary project plans provided by Mark Thomas & Company, Inc. (MTCo) and discussed the proposed improvements with the design team and the City of Chico.
- Reviewed pertinent reports and historical information as described in Section 3 of this report.
- Observed and logged the subsurface conditions in 27 exploratory borings, including test borings for the project Materials Report and the Dead Horse Slough Bridge Widening Foundation Report. Data from those studies is incorporated herein.
- Performed laboratory tests on soil samples obtained from the exploratory borings.
- Performed engineering analysis and calculations to support the conclusions and recommendations in this report.

2 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 Project Description

The City proposes to widen SR32 within the project limits from two lanes to four lanes, primarily on the north side, with local shoulder widening along the south side. In addition, the north and south-bound off-ramps from SR99 will be widened from 2-lanes to 3-lanes, and the existing 2-lane section of SR32 beneath the SR99 overpass will be modified and re-striped to accommodate 3-lanes of traffic. The existing 4-span, flat slab, concrete bridge at Dead Horse Slough (PM 11.08) will be widened by approximately 49 ft, with multi-column bents oriented to match the existing bents.

New roadway grades will generally match existing, with new fills generally less than 5 ft deep. Borrow sources for new fill have not been identified, but we expect them to be derived from local sources of a quality similar to the native soils within the project interval. No new cut slopes are anticipated for this project.

The existing SR 32 roadway will be rehabilitated, likely by Cold Foam Asphalt (CFA) recycling, and is discussed in a separate Materials Report.

The project includes approximately 8,500 lf of new soundwall. The walls are proposed to be Artisan precast walls, comprised of precast panels installed between the flanges of posts embedded in 12 inch diameter cast-in-drilled hole (CIDH) concrete piers. Wall height will be approximately 6-8 feet. The approximate soundwall locations are described in Table 1.

Table 1: Sound Wall Locations

Sound Wall	Shoulder	Station	Length (ft)
1	North CT R/W	100+62 (Fir St) to 137+85 (Forest Ave)	3,723
2	South CT R/W	129+40 to 136+96 (Forest Ave)	756
3	North CT R/W and along slough	138+60 (Forest Ave) to 144+70 (Dead Horse Slough)	610
4	North CT R/W	144+45 (Dead Horse Slough) to 152+10 (El Monte Ave)	765
5	North CT R/W	184+02 (east of Bruce Rd) to 210+50 (Yosemite Dr)	2,648

Refer to Figure 2, Sheets 1 through 9, for project limits, site topography, proposed improvements and soundwall locations.

2.2 Site Description and Existing Facilities

Within the project limits, SR 32 consists of a two lane highway along terrain that rises gently from about elev. 218 ft at the west end (near SR 99) to about elev. 382 ft at the east end (east of Yosemite Drive). The existing road is generally established on low fills (less than 5 ft deep) with minor cut sections. Surface drainage typically sheet-flows to ditches and drainage facilities. The only significant drainage is Dead Horse Slough, where SR 32 crosses with a 124-ft long and 32-ft wide concrete bridge. Other minor drainages are crossed with culverts, including the South Fork of Dead Horse Slough just east of Bruce Road.

Table 2 below lists the existing structures and drainages along the proposed improvement corridor.

Table 2: Existing Structures and Drainages

Structure/Drainage	Approx. Station	Proposed Improvement
24" CMP	129+32	Culvert Extension
Dead Horse Slough Bridge	143+00	Bridge Widening
24" CMP	152+86	Culvert Extension
24" CMP	157+50	Culvert Extension
30" CMP	161+25	Culvert Extension
6'x8' RCP Box Culvert	177+30	Culvert Extension
36" CMP	183+60	Culvert Extension

3 PERTINENT REPORTS AND INVESTIGATIONS

In preparing this report, BCI reviewed the following information pertinent to the project.

- Blackburn Consulting, *Preliminary Foundation Report, Dead Horse Slough @SR 32, Bridge No. 12-0135*, March 11, 2010.
- California Department of Transportation (Caltrans), Division of Engineering Services, Geotechnical Services, 2009, *Geotechnical Services Design Manual, Version 1.0.*
- Caltrans, *As-Built Plans, Dead Horse Slough Bridge,* November 8, 1957.
- Helley, E.J. and Harwood, D.S., 1985, *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills*, U.S. Geological Survey, Map MF-1790.
- Jennings, Charles W., 1994, *Fault Activity Map of California and Adjacent Areas with Location and Ages of Recent Volcanic Eruption*, California Department of Conservation, Division of Mines and Geology, Geologic Data Map No. 6.
- Merriam, M. Shantz, T., 2007, *2007 Caltrans Deterministic PGA Map*; State of California, Department of Transportation.
- Saucedo, G. J., and Wagner, D. L., 1992, *Geologic Map of the Chico Quadrangle,* California Division of Mines and Geology, Map No. 7A.
- Taber Consultants, *Preliminary Geotechnical Report, SR 32 Widening – Project Study Report,* November 3, 2005.

4 PHYSICAL SETTING

4.1 Climate Data

We reviewed climate data for the Chico, California, that is available at the Western Regional Climate Center website (http://www.wrcc.dri.edu). Table 3 presents monthly climatic data averages (1971-2010) for this project.

Table 3: Site Climate Data

Data Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Total Precipitation (in.)	5.30	4.44	3.43	1.85	0.98	0.45	0.02	0.09	0.45	1.36	2.92	4.38	25.65
Average Maximum Temperature (F)	53.9	60.2	65.6	72.8	81.2	89.7	96.4	94.8	89.5	78.6	64.9	54.9	75.2
Average Minimum Temperature (F)	35.6	38.6	40.9	44.6	50.5	56.4	60.3	58.0	54.2	47.1	40.1	35.9	46.8

The above data indicates that approximately 92 percent of the total annual precipitation occurs from October through April. The number of days with temperatures above 50 degrees Fahrenheit (required for paving operations) is reduced between November and March.

4.2 Topography and Drainage

The site topography rises gently to the east, from about elevation 218 ft[1] near the west end of the project (PM 10.14) to about 382 ft near the east end of the project (PM 12.65). The majority of SR 32 is constructed 2 to 5 ft above the natural grade. Surface runoff generally drains to the south and west. Specific drainages within the project corridor are listed in Table 2, above.

4.3 Man-made and Natural Features of Engineering and Construction Significance

Other than the Dead Horse Slough Bridge and existing culverts, BCI is not aware of any existing man-made or natural features that could affect, or be adversely affected by the project. Existing electrical poles and overhead power lines may have to be relocated at various locations along the corridor. Final clean-up from a former burn dump near the South Fork Dead Horse Slough (approximate Station 177+30) is in the process of being completed. To the extent possible, existing trees will be preserved in construction of the project soundwalls.

[1] Elevations are relative to mean sea level

4.4 Regional Geology and Seismicity

The site is located along the eastern side of the Great Valley Geomorphic Province, near the margin with the Sierra Nevada foothills. The Great Valley province is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north. The Great Valley is a broad, elongated, northwest trending, structural trough that has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley.

Geologic mapping by Helly and Harwood[2] shows the western half of the project (from SR99 to just east of El Monte Avenue) to be underlain by sediments of the Pleistocene-age Modesto formation, which is comprised primarily of alluvial sand, silt and clay. Older Pleistocene age sediments of the Red Bluff formation, including coarse red gravels, are mapped from about El Monte Avenue to Bruce Road. East of Bruce Road to the end of the project, bedrock of the Tuscan formation is mapped and is comprised of Pliocene age volcanic mudflows (lahars) with interbedded volcanic conglomerate and sandstone. We present a Geologic Map as Figure 3.

Based on the 2007 Caltrans Deterministic PGA Map and 2007 Fault Database, the nearest deterministic seismic sources are the Great Valley fault and Bear Mountains fault zone. Figure 4 shows the regional faults in the vicinity of the project. Table 4 shows the fault parameters.

Table 4: Fault Parameters

Fault Parameters	Great Valley fault 1	Bear Mountains fault zone
Fault Identification Number (FID)	20	30
Maximum Moment Magnitude (M_{max})	6.7	6.5
Site-to-Fault (R_{RUP}) Distance (km/mi)	43.81/27.2	40.4/25.1
Style of Faulting	Reverse	Normal
Fault Dip (degrees)	15	90
Dip Direction	West	NA

4.5 Soils Mapping

BCI reviewed the United States Department of Agriculture's "Soil Survey of Butte County" issued October, 1992. Table 5 lists the soil units mapped within the limits of this project.

[2] Helley, E.J. and Harwood, D.S., 1985, *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley*, U.S. Geological Survey, Map MF-1790.

Table 5: Soil Survey Units

Soil Name	Soil Unit No. & Description	General Location within Project Limits
Vina Fine Sandy Loam	425 Sandy loam	SR99 and SR32 Interchange area
Almendra Loam	418 Sandy loam	East of SR99 to El Monte Ave.
Redtough-Redswale Complex	302 Gravelly and cobbly loam	El Monte Ave. to Bruce Rd.
Doemill-Jokerst Complex	615 Gravelly/Cobbly loam and bedrock	Bruce Rd. to east end of project

Figure 5 shows the approximate soil boundaries within the project area. Soil Engineering Properties, as described in the Soil Survey, are included with Appendix B.

5 EXPLORATION

5.1 Drilling and Sampling

To characterize subsurface conditions for this study, BCI observed and logged 25 borings to maximum depths of 16.5 feet below ground surface. A Diedrich D120 and CME 55 drill rig were used to advance the borings using hollow stem auger drilling methods. Two additional borings were drilled for the Dead Horse Slough bridge widening to depths of about 80 ft.

BCI obtained relatively undisturbed soil samples using a 3-inch O.D. Modified California Sampler (equipped with 2.5-inch O.D. brass liners). These samplers were driven into the ground by the force of a 140-pound automatic-trip hammer falling approximately 30 inches. We sealed the sample liners with plastic caps. We also obtained bulk soil samples from the auger cuttings. Bulk samples were placed in plastic bags for transport to the laboratory. Borings were backfilled with cuttings or grout in compliance with our boring and encroachment permits.

The boring locations are shown on Figure 2, Sheets 1 through 9.

5.2 Exploration Notes

BCI encountered bedrock, with locally hard drilling conditions at the east end of Bruce Road (Station 176) to the end of the project. Borings B-20, B-21, B-23 and B-25 encountered volcanic rock at depths ranging from 1.0 to 6.6. The hollow stem augers met essential refusal at depths into rock ranging from 1 to 12 feet.

6 GEOTECHNICAL TESTING

6.1 In Situ Testing

Field tests included Standard Penetration Tests (SPT) with blow counts recorded using a 140-pound automatic-trip hammer with a 30-inch drop. The blow counts were generally within the range of 10-30, except where dense gravels or bedrock was encountered, where the blow counts exceeded 50. Pocket penetrometer tests were also performed on selected samples in the field and typically range from 1.0 to 2.0 tsf.

6.2 Laboratory Testing

Laboratory testing included the following:

- Moisture content (ASTM D2216) and unit weight (ASTM D2937)
- Plasticity Index (ASTM D4318)
- Sieve Analysis (ASTM D422)
- Unconfined Compressive Strength (ASTM D2166-06)
- Direct Shear (ASTM 3080)
- Maximum Density (CTM 216)
- Soil Resistivity, pH, sulfates/chlorides (CAL 643, 417, 422)

We attach our laboratory test results, including a summary table, in Appendix C. R-Value (CTM 301) test results are reported in the project Materials Report.

7 GEOTECHNICAL CONDITIONS

7.1 Site Geology

Geologic mapping by Helly and Harwood[3] shows the western half of the project (from SR99 to just east of El Monte Avenue) to be underlain by sediments of the Pleistocene-age Modesto formation, which is comprised primarily of alluvial sand, silt and clay. Older Pleistocene age sediments of the Red Bluff formation, including coarse red gravels, are mapped from about El Monte Avenue to Bruce Road. East of Bruce Road to the end of the project, bedrock of the Tuscan formation is mapped and is comprised of Pliocene age volcanic mudflows (lahars) with interbedded volcanic conglomerate and sandstone. We present a Geologic Map as Figure 3.

We did not observe springs, excessively wet ground, or areas of slope or ground instability.

[3] Helley, E.J. and Harwood, D.S., 1985, *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley*, U.S. Geological Survey, Map MF-1790.

7.2 Soil Conditions

Between Station 92 (beginning of project, near SR 99) to Station 176 (Bruce Road) we encountered inter-layered stiff to very stiff (locally soft and hard) clay, sandy clay, silt, and silt with sand and dense to very dense clayey gravel, sand with gravel, and gravel with clay. We interpret these soils as alluvium of the Modesto formation.

East of Bruce Road to the end of the project, we encountered stiff sandy clay and/or dense sandy gravel to depths of about 1-13 ft, underlain by volcanic mudflow "bedrock" of the Tuscan formation. Similar bedrock was encountered at a depth of about 47-55 ft at the Dead Horse Slough Bridge.

Refer to the Boring Logs in Appendix B for specific subsurface conditions encountered at each boring location. The Dead Horse Slough Bridge borings are shown on the Log of Test Borings drawing, included with the Foundation Report.

7.3 Water

7.3.1 Surface Water

Dead Horse Slough (Station 143+00) and South Fork of Dead Horse Slough (Station 177+30) are the primary drainages within the project area and flow in a southerly direction. These drainages are generally u-shaped and moderately incised. Flow is seasonal; no flow was noted in our reconnaissance in August of 2009, and minor flow was observed during our site work in April 2010. We do not expect surface water to impact the project for construction during the summer/fall months.

7.3.1.1 Scour

Channel scour does not apply for this project except at the bridge widening. Scour for bridge design is addressed in the Dead Horse Slough Foundation Report.

7.3.1.2 Erosion

We did not observe significant erosional features along the SR 32 corridor. However, some near surface granular soils are erodible if subject to concentrated surface flows.

7.3.2 Groundwater

Between the beginning of the project and Dead Horse Slough, we encountered groundwater in the borings at depths ranging from about 7-12 ft. East of Dead Horse Slough, no free ground water was encountered in the borings (to maximum depth 16 ft). Groundwater levels may fluctuate during the year, and may be seasonally perched over dense soil layers and/or bedrock.

7.4 Project Site Seismicity

7.4.1 Ground Motions

We used the fault parameters presented in Section 4 to develop deterministic response spectra and compared that to the Caltrans minimum deterministic response spectrum that assumes a maximum moment magnitude 6.5, vertical strike-slip event occurring at a distance of 7.5 miles. We then compared the deterministic results with the probabilistic response spectrum based on data from the 2008 United States Geological Survey (USGS) National Seismic Hazard Map for a 5% in 50 year probability of exceedance (975 year return period).

Based on our evaluation at the bridge site (approximately at middle of project area), we recommend a design spectrum based on the upper envelope spectral values of the combined probabilistic and minimum deterministic response spectra across the period spectrum from 0 to 5 seconds. Based on the ARS Curve developed for the bridge site, we assign the area a peak ground acceleration (PGA) of 0.23 g.

7.4.2 Ground Rupture

Our review of published geologic mapping and preliminary site review did not reveal the presence of Late Quaternary (displacement within the last 700,000 years) or younger faults within the project site. Therefore, the potential for ground rupture at the site is low.

8 GEOTECHNICAL ANALYSIS AND DESIGN

8.1 Cuts and Excavations

No significant cuts or excavations are anticipated for this project. Temporary excavations should be sloped and/or shored in accordance with current Cal OSHA requirements. For general earthwork, native soil and existing fill can be excavated with conventional earth moving equipment. East of Station 176+00, grading below a few feet of ground surface will encounter shallow rock and require heavy equipment (such as a CAT D9) for removal; deeper grading may generate oversize rock requiring off-site disposal (or outside of embankment prisms).

8.2 Embankments

We expect new embankment fills along the north side of SR 32 will be minor, typically 5 ft deep or less. Embankment fills for the SR 99 ramp widenings will similarly be about 5 ft deep, or less. These embankments will be constructed using imported borrow materials as they become available from different sources in the project vicinity. The source of fill material is not known at this time.

Since the import borrow sources are not yet identified, embankment materials cannot be evaluated. However, we expect slopes constructed at gradients of 2:1 (horizontal to vertical) or flatter to be grossly stable when constructed with approved materials and in accordance with the Caltrans Standard Earthwork Specifications.

Because the foundation soils consist predominantly of medium dense to dense granular soils and very stiff to hard fine-grained soils, the potential for significant long-term settlement, due to compression of native soils, is low and a waiting period for settlement is not required.

8.3 Culvert Foundations

We list new culvert extensions for local drainage in Table 6 below.

Table 6: Planned Culvert Extensions

Culvert Station Location	Culvert Size and Type
129+32	24" CMP
152+86	24" CMP
157+50	24" CMP
161+25	30" CMP
177+30	6'x8' RCP box
183+60	36" CMP

All culvert extensions will be constructed within shallow native soils and/or within engineered embankment fill. Shallow native soils and embankment fills (constructed in accordance with the Standard Earthwork Specifications) are suitable for culvert placement when designed and placed in accordance with the Highway Design Manual, Standard Plans, and Standard Specifications.

8.4 Sound Walls

The proposed sound walls are Artisan Precast walls with 12 inch diameter pier foundations. The manufacturer's design shows a minimum pier depth of 5.5 ft (for 8 ft high wall), assuming minimum soil properties in accordance with the 2007 California Building Code (CBC). We show the CBC presumptive soil values in Table 7.

Table 7: Allowable Foundation and Lateral Pressure[4]

Class of Materials	Allowable Foundation Pressure (psf)	Lateral Bearing (psf/f below natural grade)	Lateral Sliding	
			Coefficient of Friction	Resistance (psf)
Granular Soils (SW, SP, SM, SC GM and GC)	2,000	150	0.25	--
Cohesive Soils (CL, ML, MH and CH)	1,500	100	--	130

[4] From Table 1804.2, 2007 CBC

Caltrans Standard Plans for masonry block sound walls on pile cap, with a soil friction angle of 30° and level ground on both sides of the wall, specifies a minimum pier depth of 5.5 ft for a 6 ft high wall and 7.0 ft for an 8 ft high wall.

Our boring data indicate that the walls west of El Monte Avenue (Walls No. 1 through 4, per Table 1) will be constructed in native soils comprised of stiff clay and dense clayey sand/gravel. We consider these soils to meet the minimum friction angle of 30° and presumptive bearing per Table 7. Owing to surface variations (including some disturbed soils within the upper foot), we recommend minimum pier depths for Walls No. 1 through 4 as shown on Table 8.

Table 8: Sound Wall Pier Depth – Walls No. 1 through 4

Maximum Wall Height (ft)	Minimum Pier Depth (ft)
6.0	6.0
8.0	7.0
10.0	8.0

Wall No. 5 is located between Bruce Road and Yosemite Drive. This wall is underlain by shallow bedrock, generally within 2 ft of ground surface. Our drilling with hollow stem auger was generally able to penetrate at least 5 ft into the rock material, except for B-23 where refusal was encountered at depth 2 ft. We recommend a minimum 5 ft pier depth for this wall for all heights less than 10 ft.

9 MATERIAL SOURCES

At the time of this report import borrow material sources are not identified. We expect that project borrow will likely be from several different sources similar to the native soils within the project limits, however may vary in type and quantity. BCI must approve new sources prior to placement.

10 CONSTRUCTION CONSIDERATIONS

10.1 Construction Advisories

10.1.1 Caving Conditions

During our exploration we encountered local areas of granular soils that may be susceptible to sluffing and/or caving. The contractor is responsible for the stability of any temporary excavations.

At a minimum, all shoring should be in accordance with current CalOSHA requirements. In accordance with these requirements, the soil type for shoring design should correspond to the weakest layer. The contractor is responsible for final excavation and shoring design and construction based on actual excavation conditions encountered during construction.

10.1.2 Perched Ground Water and Over-optimum Soil Moisture

During our exploration we encountered clay layers to depths of approximately 12 ft at the west end of the project and shallow soil over bedrock at the east end. These materials may inhibit infiltration and cause perched water during the rainy season. Excessively over-optimum (wet) soil conditions may be present during the winter and spring months and can make proper compaction difficult.

If encountered, wet soil can be mitigated by:

- Discing the soil during prolonged periods of dry weather
- Overexcavating and replacement with drier material
- Lime treatment or stabilization using aggregate and/or stabilization fabric

If wet, unstable soil is encountered, BCI can observe the conditions and provide more specific mitigation recommendations.

10.1.3 Pier Excavations

Pier drilling for Wall No 5 (between Bruce Road and Yosemite Drive) will encounter bedrock of the Tuscan formation. While heavy duty auger equipment is expected to achieve the minimum 5 ft depth, some drilling will be difficult and may require alternative drilling methods.

10.2 Differing Site Conditions

BCI based this report on the current site conditions. We assume the soil and ground water conditions encountered in our borings are representative of the subsurface conditions across the site. Actual conditions between borings could be different. If differing site conditions are encountered, contact BCI to provide additional recommendations.

11 GEOTECHNICAL RECOMMENDATIONS AND SPECIFICATIONS

This section presents our recommended geotechnical specifications, and special provisions, to be used in design and construction of the roadway portions of the project. If designers have questions or problems with any of these recommendations, or if conditions are found to be different during construction, contact BCI to determine if additional field work, analysis, or recommendations are required.

Where referenced below, Standard Specifications and Standard Plans refer to the Caltrans 2006 Standard Plans and Specifications.

11.1 Earthwork

Earthwork shall be performed in accordance with Section 19 of the Standard Specifications. *Structural Backfill* shall conform to Section 19-3 of the Standard Specifications. In addition, earthwork and structural backfill shall be performed in accordance with the following Special Provisions. If a conflict exists between the Standard Specifications and Special Provisions below, the Special Provisions govern.

11.2 Special Provision for Acceptable Fill and Borrow Material

In general, on-site soil is suitable for use as fill for the project provided it is free of concentrations of organics, debris, and oversize material (12 inch maximum dimension for general embankment). We do not know of any unsuitable material, other than surface strippings and possible oversize rock generated east of Bruce Road, within the project alignment.

Soundwall design is based on embankment fill with a minimum angle of shearing resistance (Ø) = 30°. Any embankment fill placed at soundwall locations must meet these minimum criteria. Fill material meeting the Standard Specification for structure backfill (Section 19-3.06) should meet the soundwall fill criteria.

In roadway widening areas, borrow material should have a minimum R-value of 50 (consistent with Caltrans Class-2 Aggregate Subbase) and contain no vegetation or debris. Borrow material for structure backfill must meet requirements of Section 19 of the Standard Specifications.

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services during design and construction. For this project, BCI should be retained to:

- Review and provide comments on the civil plans and specifications prior to construction.
- Monitor construction to check and document our report assumptions. At a minimum, BCI should monitor grading, culvert backfill, pavement subgrade and aggregate base compaction, and soundwall pile excavation.
- Review proposed borrow material for suitability.
- Update this report if design changes occur, 2 years or more lapses between this report and construction, and/or site conditions have changed.

If we are not retained to perform the above applicable services, we are not responsible for any other party's interpretation of our report, and subsequent addendums, letters, and discussions.

13 LIMITATIONS

BCI performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Where referenced, we used ASTM or Caltrans standards as a general (not strict) *guideline* only. We do not warranty our services. Do not use or rely on this report for different locations or improvements without the written consent of Blackburn Consulting (BCI).

Our scope for this report did not include evaluation of on-site hazardous material, flood potential, aerial photograph review, or biological pollutants. Please contact BCI if you would like an evaluation of one or more of these potentially damaging issues.

The Borings Logs are presented in Appendix A. The lines designating the interface between soil types are approximate. The transition between material types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions.

Modern design and construction is complex, with many regulatory sources/restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on project complexities and cost estimates to cover changes and delays.

FIGURES:

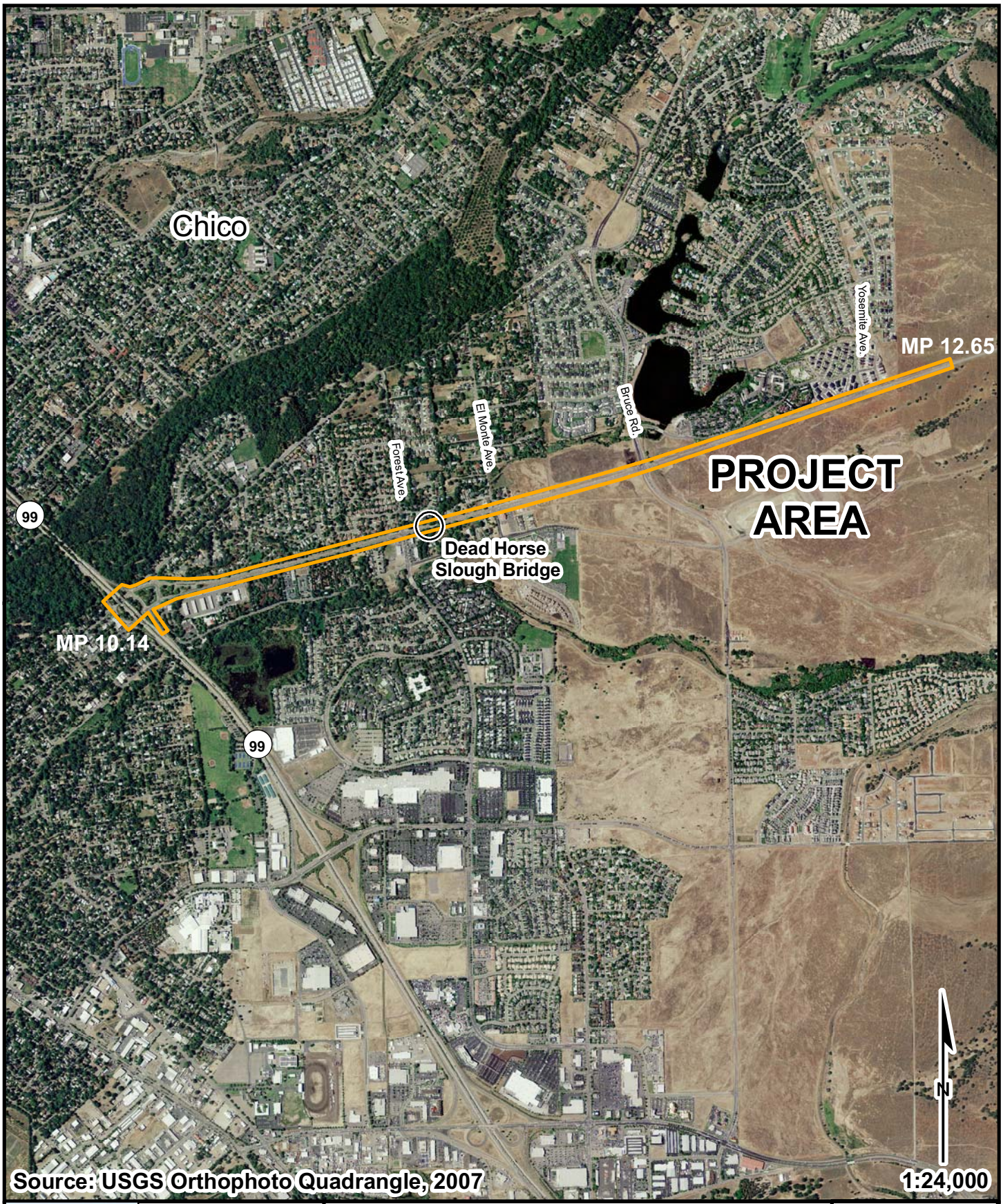
Figure 1: Vicinity Map

Figure 2: Boring Location Map (9 Sheets)

Figure 3: Geologic Map

Figure 4: Soil Survey Map

Figure 5: Fault Map



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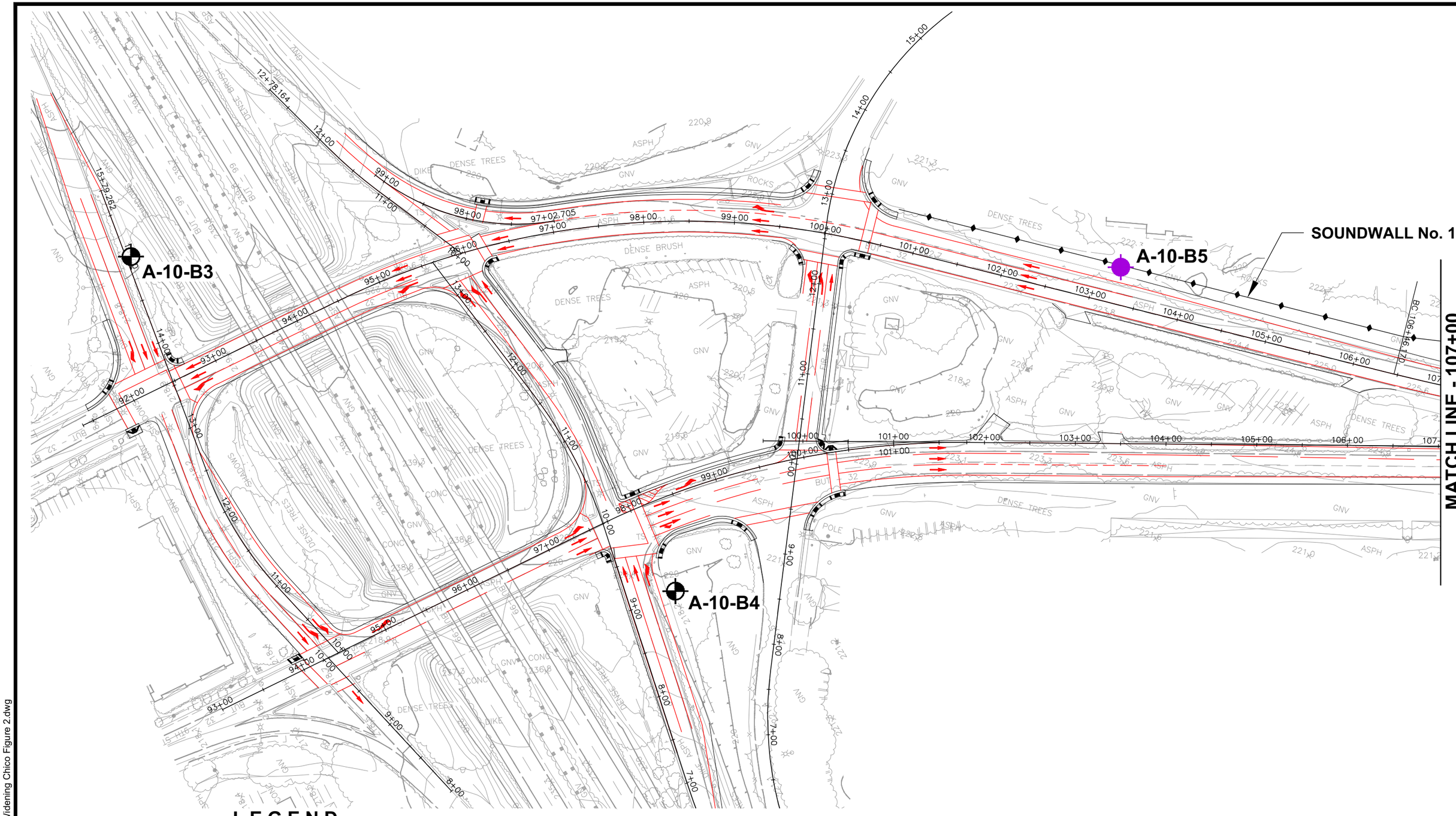
VICINITY MAP

SR 32 Widening Project, 03-But-32
SR 99 to Yosemite Drive, MP 10.14/12.65
Chico, California

File No. 1202.2

October 2010

Figure 1



SCALE: 1"=100'

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BORING LOCATION MAP

SR32 Widening
PM 10.14 to 12.65
Chico, California

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Figure 2
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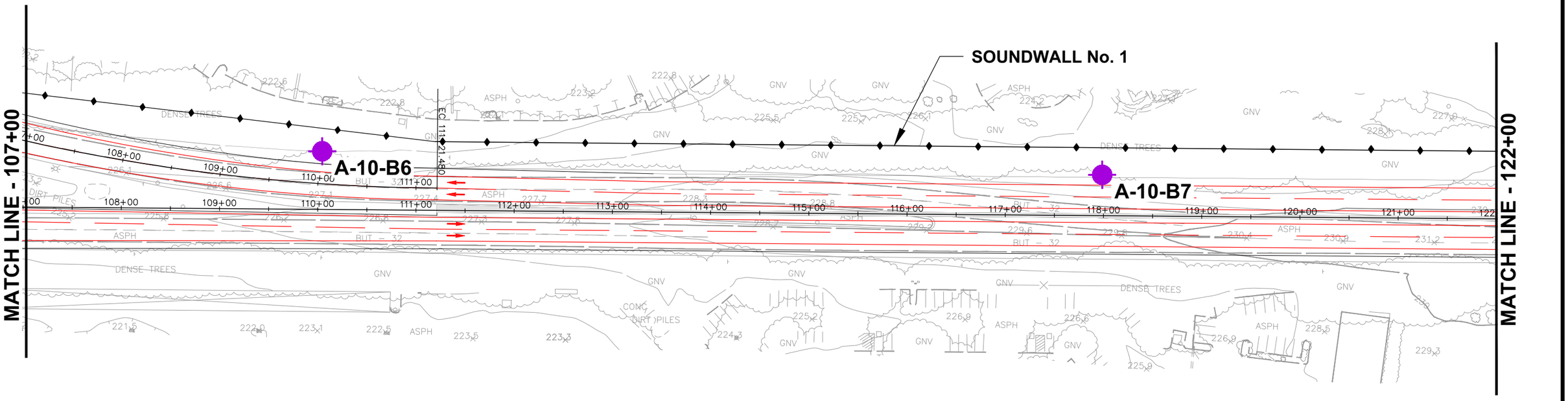
10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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Auburn, CA 95603
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Fax: (530) 887-1495
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BORING LOCATION MAP

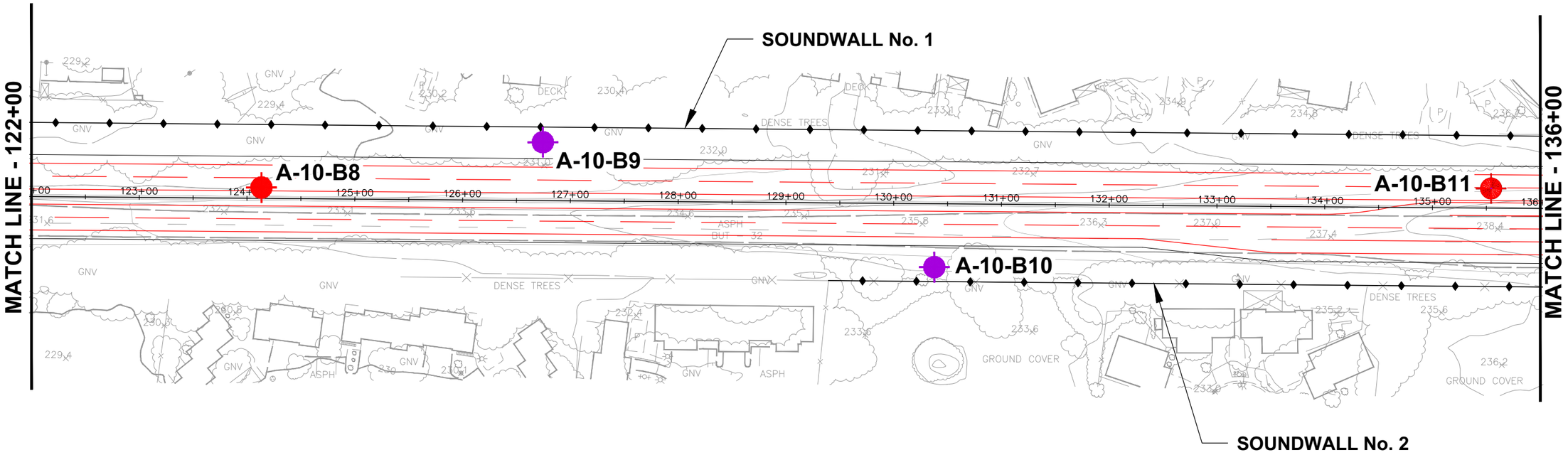
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 2 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

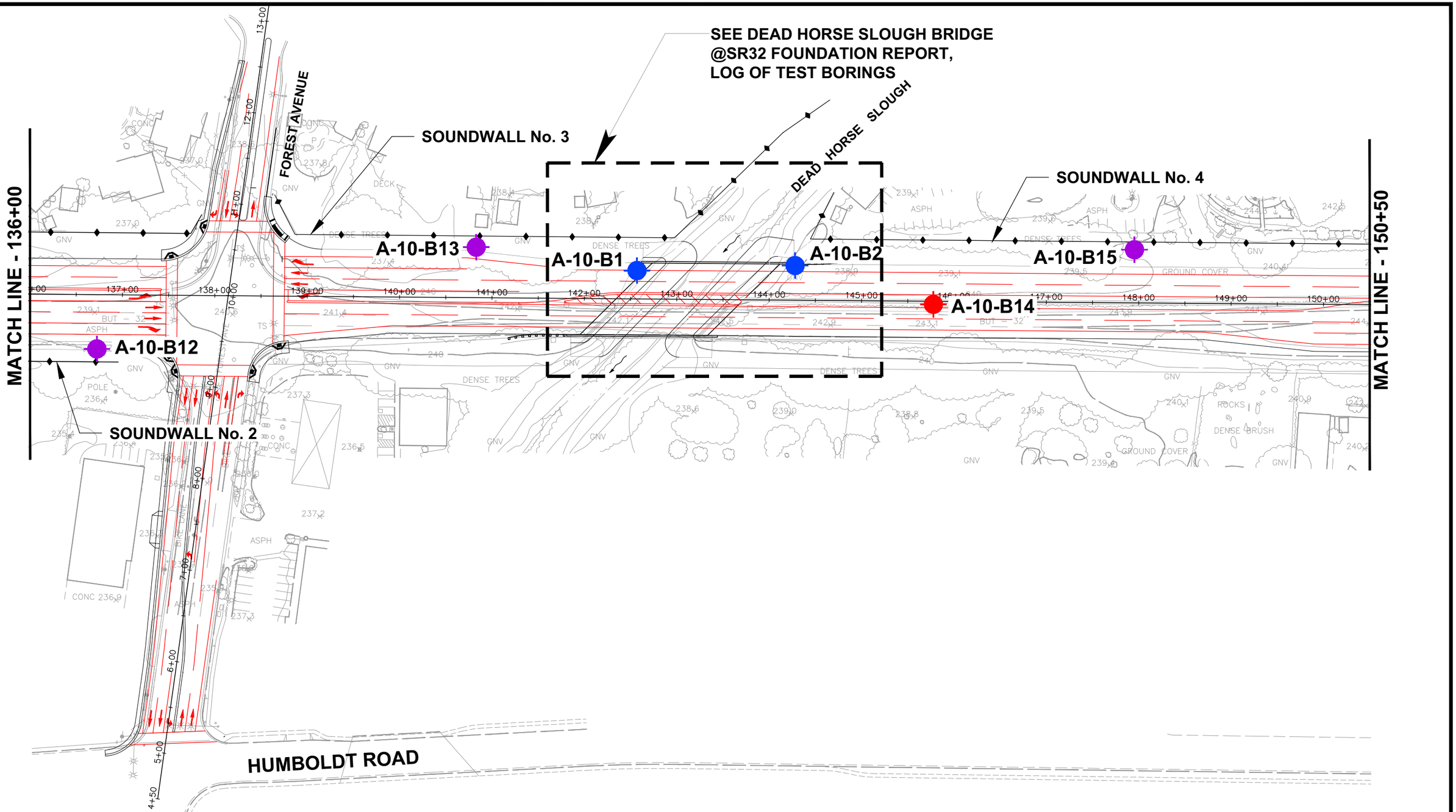
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 3 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

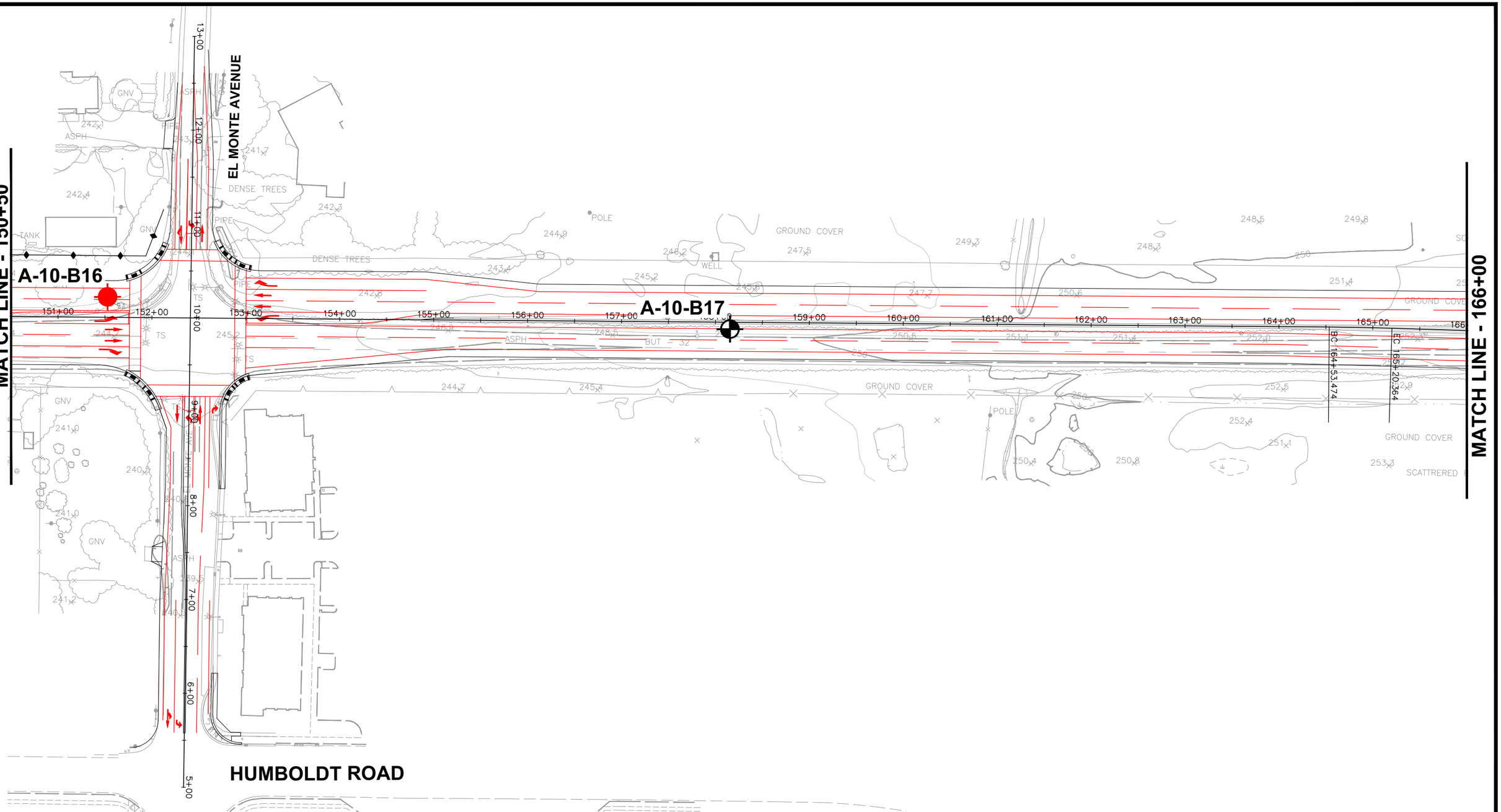
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 4 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 5 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg

MATCH LINE - 166+00

MATCH LINE - 181+50

A-10-B18

A-10-B19

BRUCE ROAD

DEAD HORSE SLOUGH SOUTH FORK

BC 169+91.712

EC 170+58.602

BC 172+79.138

EC 178+73.256

LEGEND

- Geotechnical Roadway Boring
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- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

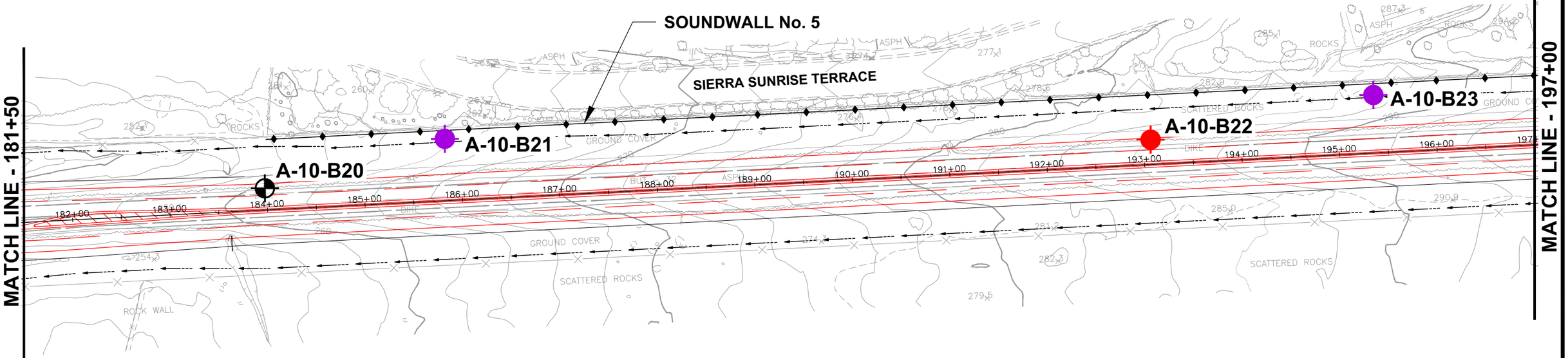
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 6 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

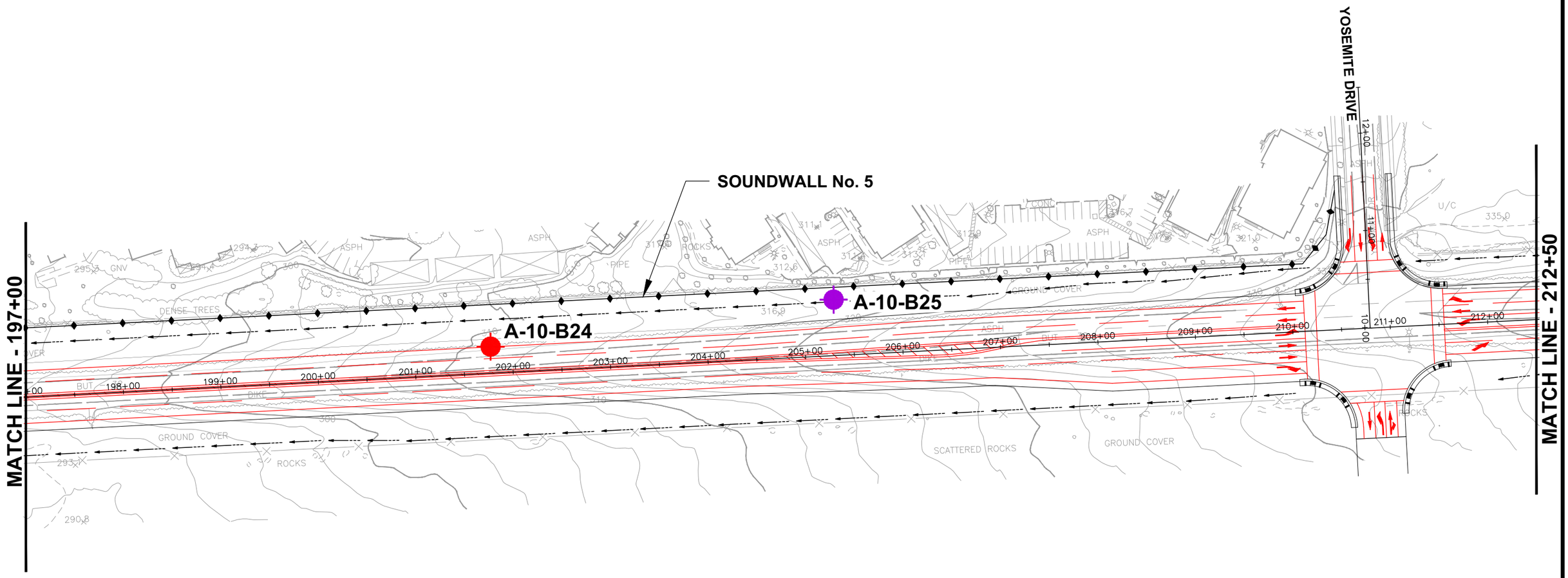
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 7 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



LEGEND

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SCALE: 1"=100'

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BORING LOCATION MAP

SR32 Widening
PM 10.14 to 12.65
Chico, California

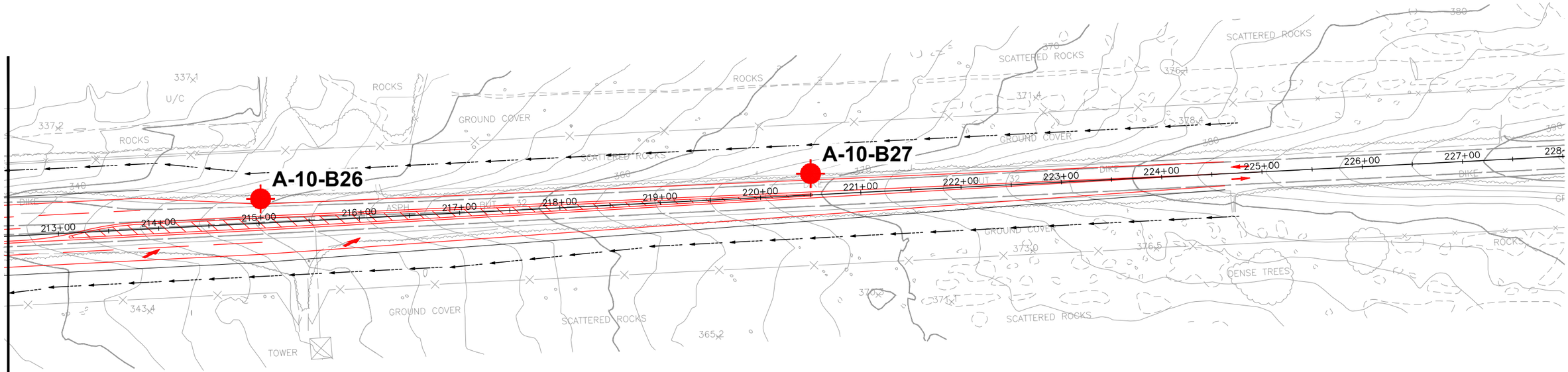
File No. 1202.2

October 2010

Figure 2
Page 8 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg

MATCH LINE - 212+50



LEGEND

- Geotechnical Roadway Boring
- Bridge Foundation Boring
- Proposed Soundwall
- Soundwall Boring
- Pavement (Materials) Boring

SCALE: 1"=100'

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BORING LOCATION MAP

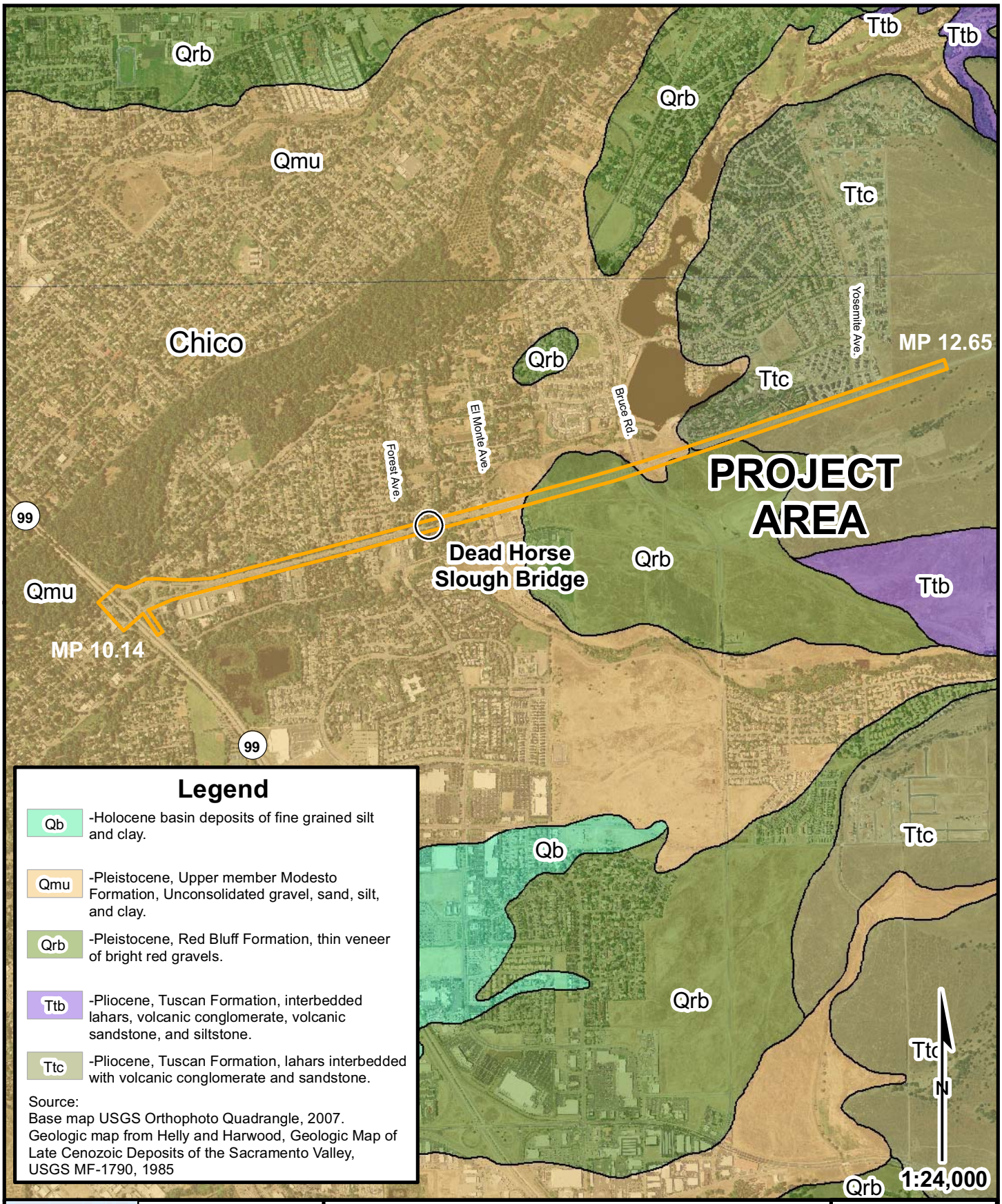
SR32 Widening
PM 10.14 to 12.65
Chico, California

File No. 1202.2

October 2010

Figure 2
Page 9 of 9

10/28/2010 1202.2 SR32 Widening Chico Figure 2.dwg



Legend

- Qb -Holocene basin deposits of fine grained silt and clay.
- Qmu -Pleistocene, Upper member Modesto Formation, Unconsolidated gravel, sand, silt, and clay.
- Qrb -Pleistocene, Red Bluff Formation, thin veneer of bright red gravels.
- Ttb -Pliocene, Tuscan Formation, interbedded lahars, volcanic conglomerate, volcanic sandstone, and siltstone.
- Ttc -Pliocene, Tuscan Formation, lahars interbedded with volcanic conglomerate and sandstone.

Source:
Base map USGS Orthophoto Quadrangle, 2007.
Geologic map from Helly and Harwood, Geologic Map of Late Cenozoic Deposits of the Sacramento Valley, USGS MF-1790, 1985

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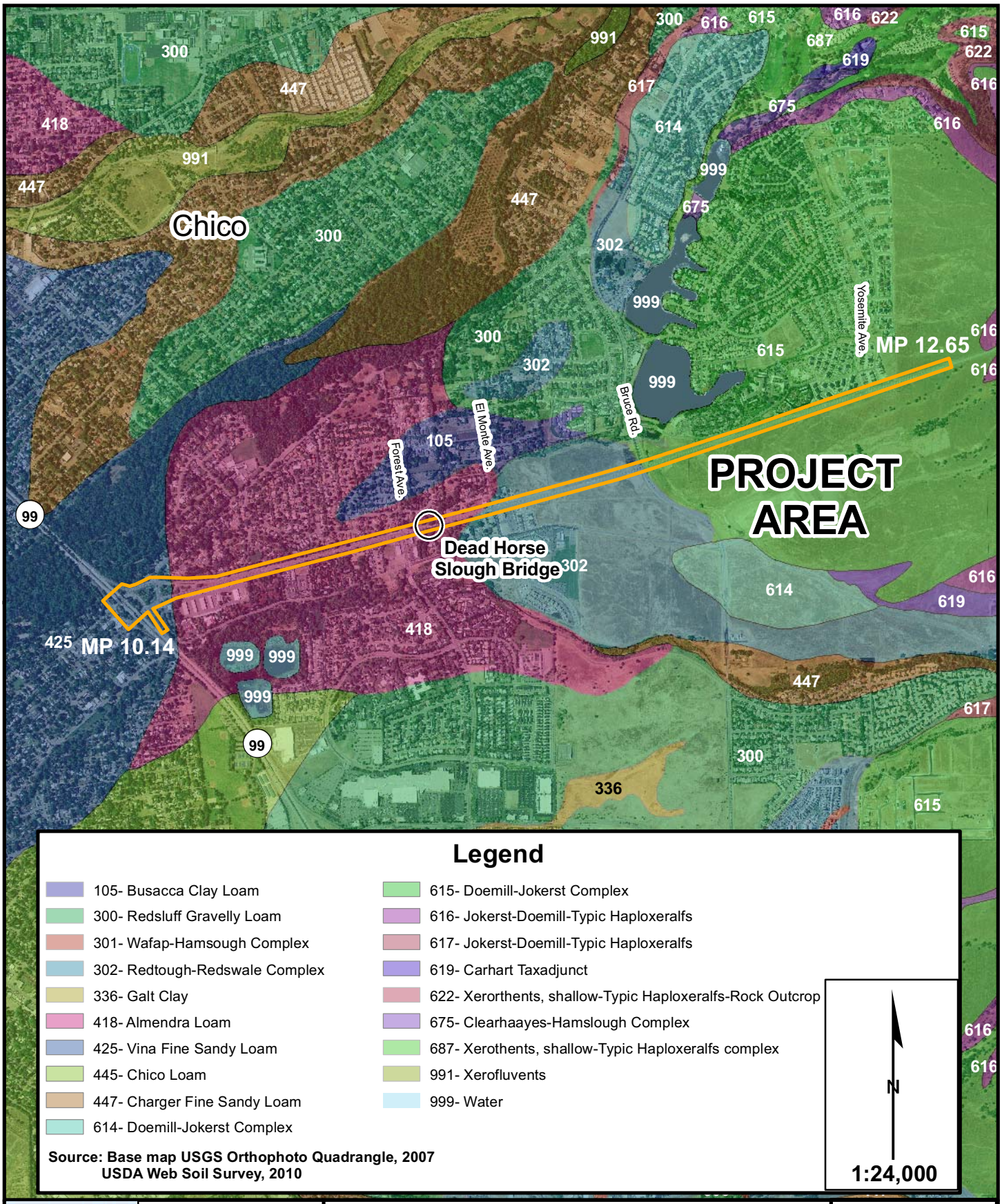
GEOLOGIC MAP

SR 32 Widening Project, 03-But-32
SR 99 to Yosemite Drive, MP 10.14/12.65
Chico, California

File No. 1202.2

October 2010

Figure 3



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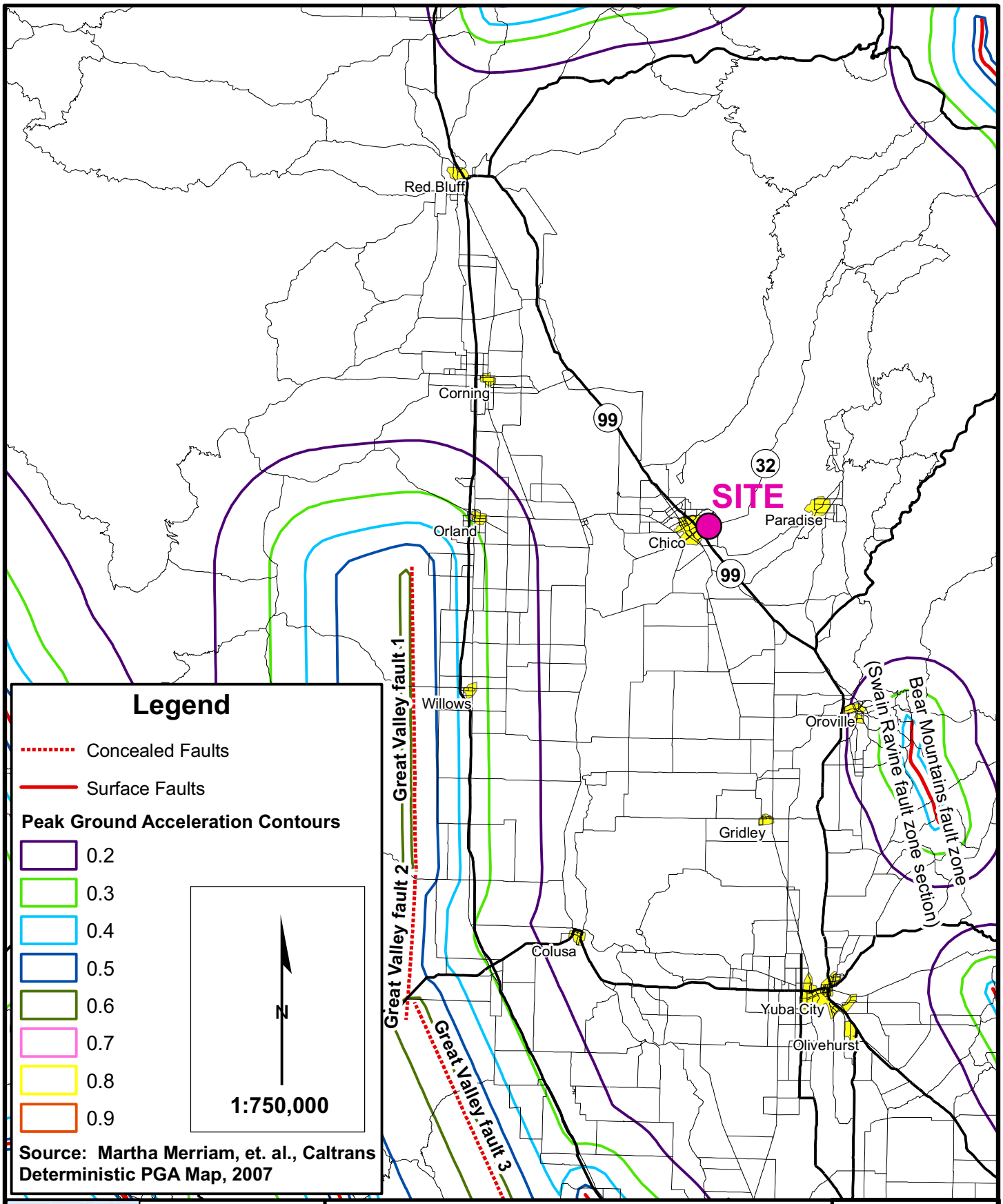
SOIL SURVEY MAP

SR 32 Widening Project, 03-But-32
SR 99 to Yosemite Drive, MP 10.14/12.65
Chico, California

File No. 1202.2

October 2010

Figure 4



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REGIONAL FAULT MAP

SR 32 Widening Project, 03-But-32
SR 99 to Yosemite Drive, MP 10.14/12.65
Chico, California

File No. 1202.2

October 2010

Figure 5

APPENDIX A:

Boring Logs and Legend

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-14-10	4-14-10	39° 44' 12.2814" / 121° 49' 14.052" NAD83	A-10-B3
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~10.00' Lt Sta ~15+00	~221.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE) / TOTAL DEPTH OF BORING
Backfilled with native cuttings			12.2 ft	12.2 ft on4-14-10 / 15.1 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; dark reddish brown; moist; few GRAVEL; few SAND; mostly fines.												
	1				Bag O			100							PA, R PI
219.00	2				1	12	33	33				PP = 1.5			
						16									
	3					17				25	87				M, UW
217.00	4														
	5				2	7	10	83				PP = 1.25			
						5									
215.00	6					5				27	92				UC
	7														
213.00	8														
	9														
	10														

(continued)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE				HOLE ID
BORING RECORD				A-10-B3
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 2

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	10		Lean CLAY (CL) *(continued)*.		3	3 10	33	83							
	11		CLAYEY GRAVEL (GC); medium dense; reddish brown; moist; mostly GRAVEL; little fines.			23				17	121				M, PA, UW PA
209.00	12														
	13		Poorly graded GRAVEL (GP); dense to very dense; dark reddish brown; wet; about 10% COBBLES; mostly GRAVEL; some SAND.												
207.00	14														
	15				4	50/1"	REF	0							
			Bottom of borehole at 15.1 ft bgs												
205.00	16														
	17														
203.00	18														
	19														
201.00	20														
	21														
	22														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE				HOLE ID
BORING RECORD				**A-10-B3**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**BUT**	**32**		**03-1202.1**
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-15-10	4-15-10	39° 44' 10.5072" / 121° 49' 5.8182" NAD83	A-10-B4
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~100.00' Rt Sta ~98+10	~219.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hand Auger			Hand Auger	3 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Other				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	4.4 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; reddish brown; moist; few SAND; mostly fines.												
	1														
217.00	2														
	3				1			100							
215.00	4		CLAYEY GRAVEL (GC); medium dense; brown; moist; mostly GRAVEL; few SAND; some fines.		2			100							
			Bottom of borehole at 4.4 ft bgs												
	5														
213.00	6														
	7														
211.00	8														
	9														
209.00	10														
	11														
207.00	12														
	13														
205.00	14														
	15														
203.00	16														
	17														
201.00	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE				HOLE ID
BORING RECORD				A-10-B4
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-14-10	4-14-10	39° 44' 15.1722" / 121° 49' 1.3044" NAD83	A-10-B5
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~40.00' Lt Sta ~103+20	~222.5 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 9.7 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); medium stiff; dark reddish brown; moist; few GRAVEL; mostly fines.												
220.50	2				1	2 2 3	5	38				PP = 0.5			
218.50	4														
	5				2	3 11 36	47	100							
216.50	6		CLAYEY GRAVEL (GC); dense; reddish brown; moist; mostly GRAVEL; little SAND; some fines.												
214.50	8		Poorly graded GRAVEL (GP); very dense; reddish brown; moist to wet; about 10% COBBLES; mostly GRAVEL; little SAND; trace fines.												
212.50	10				3	32 50/4"	50/4	0							
210.50	12														
208.50	14														
	15				4	14 24 34	58	100							
206.50	16														
	17		Bottom of borehole at 16.5 ft bgs												
204.50	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE				HOLE ID
BORING RECORD				A-10-B5
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-14-10	4-14-10	39° 44' 15.6546" / 121° 48' 52.146" NAD83	A-10-B6
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~30.00' Lt Sta ~110+00	~224.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 10.2 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				15.5 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY GRAVEL (GC); loose; olive gray; moist; mostly GRAVEL; some fines [FILL].												
	1														
222.00	2		Lean CLAY (CL); medium stiff; dark reddish brown; moist; mostly fines.		1	3 3 3	6	0							
	3														
220.00	4														
	5		CLAYEY SAND (SC); dense; reddish brown; moist; mostly SAND; some fines.		2	5 5 7	12	100							
218.00	6														
	7														
216.00	8		CLAYEY GRAVEL (GC); very dense; reddish brown; moist to wet; mostly GRAVEL; few SAND; little fines.												
	9														
214.00	10				3	13 34 35	69	100							
	11														
212.00	12														
	13														
210.00	14														
	15				4	54		100							
208.00	16		Bottom of borehole at 15.5 ft bgs												
	17														
206.00	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B6
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-14-10	4-14-10	39° 44' 17.3682" / 121° 48' 42.4902" NAD83	A-10-B7
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~45.00' Lt Sta ~118+00	~227.8 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 10.0 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				15.5 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; dark reddish brown; moist; some SAND; mostly fines.												
	1														
225.80	2				1	2 2 4	6	100				PP = 1.5			
	3														
223.80	4														
	5				2	5 6 7	13	11							
221.80	6														
	7														
219.80	8		CLAYEY SAND (SC); loose; reddish brown; moist to wet; mostly SAND; some fines.												
	9														
217.80	10				3	5 6 7	13	0							
	11														
215.80	12														
	13		Poorly graded GRAVEL (GP); loose to medium dense; reddish brown; wet; mostly GRAVEL; some SAND.												
213.80	14		CLAYEY SAND (SC); stiff; reddish brown; wet; some SAND; mostly fines.												
	15		Poorly graded GRAVEL (GP); very dense; reddish brown; wet; mostly GRAVEL; some SAND; few fines.		4	50/6"	REF	100							
211.80	16		Bottom of borehole at 15.5 ft bgs												
	17														
209.80	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B7
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-7-10	4-7-10	39° 44' 18.4" / 121° 48' 35.1" NAD83	A-10-B8
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~10.00' Lt Sta ~124+15	~230.1 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY GRAVEL (GM); loose; brown; dry to moist; mostly coarse to fine GRAVEL; little fines [FILL].												
	1				Bag J										
			Lean CLAY with SAND (CL); stiff; dark reddish brown; moist; little SAND; mostly fines.												CP, CR
228.10	2														
	3														
226.10	4														
	5		Bottom of borehole at 5.0 ft bgs												
224.10	6														
	7														
222.10	8														
	9														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B8
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-14-10	4-14-10	39° 44' 19.467" / 121° 48' 31.9962" NAD83	A-10-B9
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~50.00' Lt Sta ~126+75	~230.7 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			10.0 ft	15.5 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; brown; moist; some SAND; mostly fines.												
228.70	2				1	2 3 2	5	100				PP = 1.25			
226.70	4		SILTY SAND (SM); medium dense; reddish brown; moist; mostly SAND; some fines.												
	5				2	7 15 13	28	50				PP = >4.5			
224.70	6														
222.70	8														
220.70	10		Poorly graded GRAVEL (GP); very dense; reddish brown; moist to wet; mostly GRAVEL; some SAND; few fines.		3	40 50/5"	50/5	0							
218.70	12														
216.70	14														
	15				4	50/6"	REF	100							
214.70	16		Bottom of borehole at 15.5 ft bgs												
212.70	18														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B9
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-15-10	4-15-10	39° 44' 19.4424" / 121° 48' 26.6646" NAD83	A-10-B10
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~55.00' Rt Sta ~130+40	~234.1 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 9.0 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; dark reddish brown; moist; trace GRAVEL; mostly fines.												
232.10	2				1	3 3 3	6	33				PP = 1.0			
230.10	4														
	5				2	2 3 3	6	56				PP = 1.0			
228.10	6														
226.10	8		SANDY lean CLAY (CL); stiff; reddish brown; moist to wet; trace GRAVEL; some SAND; mostly fines.												
224.10	10				3	5 8 11	19	89				PP = 2.0			
222.10	12		CLAYEY GRAVEL (GC); dense; reddish brown; wet; mostly GRAVEL; mostly SAND; few fines.												
220.10	14														
	15				4	11 29 32	61	100							
218.10	16		Bottom of borehole at 16.5 ft bgs												
216.10	18														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B10
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-7-10	4-7-10	39° 44' 21.33" / 121° 48' 20.71" NAD83	A-10-B11
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~20.00' Lt Sta ~135+50	~235.9 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY GRAVEL (GM); loose to medium dense; brown; moist; mostly coarse to fine GRAVEL; little fines [FILL].												
	1				Bag I										R
233.90	2		Lean CLAY (CL); stiff; reddish black; moist; few fine SAND; mostly fines.		1	4 4 8	12	67				PP = 1.75			
	3									26	96				UC
231.90	4														
	5		Bottom of borehole at 5.0 ft bgs												
229.90	6														
	7														
227.90	8														
	9														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B11
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-15-10	4-15-10	39° 44' 20.9646" / 121° 48' 18.7194" NAD83	A-10-B12
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~60.00' Rt Sta ~136+80	~238.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 9.3 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; reddish black; moist; few SAND; mostly fines.												
	1														
236.00	2				1	4 5 6	11	100				PP = 1.0			
	3														
234.00	4														
	5				2	4 5 7	12	100				PP = 2.0			
232.00	6														
	7														
230.00	8														
	9		SILTY SAND (SM); medium dense; reddish brown; wet; mostly SAND; some fines.												
228.00	10				3	6 9 17	26	100							
	11														
226.00	12		SILTY GRAVEL (GM); very dense; reddish brown; wet; mostly GRAVEL; little SAND; some fines.												
	13														
224.00	14														
	15				4	24 37 44	81	100							
222.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
220.00	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B12
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-15-10	4-15-10	39° 44' 23.0568" / 121° 48' 14.0688" NAD83	A-10-B13
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~55.00' Lt Sta ~140+90	~238.2 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 9.7 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; reddish black; moist; few SAND; mostly fines.												
	1														
236.20	2				1	6 7 6	13	33				PP = 1.5			
	3														
234.20	4														
	5		SILTY SAND (SM); loose; dark reddish brown; moist to wet; mostly SAND; some fines.		2	4 4 6	10	100							
232.20	6														
	7														
230.20	8														
	9														
228.20	10				3	7 10 14	24	100							
	11														
226.20	12														
	13		CLAYEY GRAVEL (GC); very dense; reddish brown; wet; mostly GRAVEL; little SAND; some fines.												
224.20	14														
	15				4	18 49 47	96	44							
222.20	16														
	17		Bottom of borehole at 16.5 ft bgs												
220.20	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B13
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-8-10	4-8-10	39° 44' 23.87" / 121° 48' 7.24" NAD83	A-10-B14
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~10.00' Rt Sta ~145+75	~239.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	6.5 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY with GRAVEL (CL); stiff; very dark brown; moist; little coarse to fine GRAVEL; mostly fines.		Bag M,N										CP, CR
237.00	2														
235.00	4														
	5				1	5	14	50				PP = 1.75			
						6									
233.00	6					8									
			Bottom of borehole at 6.5 ft bgs												
231.00	8														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B14
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-15-10	4-15-10	39° 44' 24.954" / 121° 48' 5.2164" NAD83	A-10-B15
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~60.00' Lt Sta ~147+90	~240.1 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 7.1 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); very stiff; reddish brown; moist; little SAND; mostly fines.												
	1														
238.10	2				1	4 6 7	13	100				PP = 4			
	3														
236.10	4														
	5				2	5 6 7	13	100							
234.10	6		CLAYEY SAND (SC); loose; dark brown; moist to wet; few GRAVEL; mostly SAND; some fines.												
	7														
232.10	8														
	9														
230.10	10				3	3 5 5	10	100							
	11														
228.10	12														
	13														
226.10	14		CLAYEY GRAVEL (GC); dense; dark brown; wet; mostly GRAVEL; few SAND; some fines.												
	15				4	25 32 26	58	50							
224.10	16														
	17		Bottom of borehole at 16.5 ft bgs												
222.10	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B15
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-8-10	4-8-10	39° 44' 25.49" / 121° 48' 0.82" NAD83	A-10-B16
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~20.00' Lt Sta ~151+45	~241.9 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	6.5 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); stiff; very dark brown; moist; few coarse to fine GRAVEL; mostly fines.		Bag K,L										R
	1														
239.90	2														
	3														
237.90	4														
	5				1	5	18	50				PP = 2.25			
						8									
235.90	6					10									
			Bottom of borehole at 6.5 ft bgs												
	7														
233.90	8														
	9														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B16
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 26.7786" / 121° 47' 52.9764" NAD83	A-10-B17
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~5.00' Rt Sta ~158+20	~249.6 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY GRAVEL (GC); medium dense; dark brown; moist; mostly GRAVEL; few SAND; some fines.												
	1				Bag H			100							
247.60	2		Lean CLAY (CL); very stiff; dark reddish brown; moist; few GRAVEL; some SAND; mostly fines.		1	5 8 9	17	100				PP = 2.0			
	3														
245.60	4		CLAYEY GRAVEL (GC); dense; dark reddish brown; moist; mostly GRAVEL; few SAND; some fines.												
	5				2	50/4.5"	REF	100							
243.60	6														
	7		SILTY SAND (SM); medium dense; brown; moist; mostly SAND; some fines.												
241.60	8														
	9														
239.60	10		SANDY lean CLAY (CL); soft; brown; moist; some SAND; mostly fines.		3	19 54		100				PP = >4.5			
	11		SANDY lean CLAY (CL); hard; brown; moist; some SAND; mostly fines.												
237.60	12														
	13														
235.60	14														
	15				4	17 20 39	59	89							
233.60	16		CLAYEY SAND (SC); dense; brown; moist; mostly SAND; some fines.												
	17		Bottom of borehole at 16.5 ft bgs												
231.60	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B17
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 29.26" / 121° 47' 40.66" NAD83	A-10-B18
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~20.00' Lt Sta ~167+70	~253.1 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	4.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY GRAVEL with COBBLES (GM); medium dense to dense; olive brown; moist; about 5 to 10% COBBLES; mostly coarse to fine GRAVEL; few coarse to medium SAND; little fines; COBBLES consist of Andesite, moderately to slightly weathered, hard, subrounded.		Bag G										R
251.10	2														
249.10	4		Bottom of borehole at 4.0 ft bgs												
247.10	6														
245.10	8														
	10														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

Department of Transportation
Division of Engineering Services
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Office of Geotechnical Design - Support

REPORT TITLE				HOLE ID
BORING RECORD				A-10-B18
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 31.8012" / 121° 47' 29.6262" NAD83	A-10-B19
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~40.00' Lt Sta ~176+70	~253.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Diedrich D120	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING 13.8 ft AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings				15.3 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); soft to medium stiff; brown; moist; some SAND; mostly fines.												
	1		SANDY lean CLAY (CL); stiff; brown; moist; about 20% COBBLES; some SAND; mostly fines.		Bag E			100							
251.00	2														
	3														
249.00	4		SANDY lean CLAY (CL); stiff to very stiff; brown; moist; some SAND; mostly fines.												
	5				1	4 5 3	8	100				PP = 1.0			
247.00	6														
	7														
245.00	8		SANDY lean CLAY (CL); stiff; brown; wet; trace GRAVEL; some SAND; mostly fines.												
	9														
243.00	10				2	3 4 7	11	100				PP = 1.0			
	11														
241.00	12														
	13		IGNEOUS ROCK (BRECCIA), massive, olive gray, intensely to moderately weathered, moderately soft, intensely to moderately fractured.												
239.00	14														
	15				3	50/4"	REF	100							
			Bottom of borehole at 15.3 ft bgs												
237.00	16														
	17														
235.00	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B19
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	**4-7-10**	**4-7-10**	**39° 44' 33.8346" / 121° 47' 20.7384" NAD83**	**A-10-B20**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			**~25.00' Lt Sta ~184+00**	**~260.1 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**CME 55 (track)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			**Automatic Hammer**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			**GW not encountered**	**6.9 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY GRAVEL (GC); dense; brown; moist; mostly GRAVEL; little SAND; some fines [FILL].												
	1				Bag F			100							
258.10	2				1	16 36 27	63	33							
	3														
256.10	4														
	5				2	20 18 6	24	83							
254.10	6														
	7		IGNEOUS ROCK (BRECCIA), massive, light gray, moderately to slightly weathered, moderately hard to hard.		3	50/0" REF									
252.10	8		Bottom of borehole at 6.9 ft bgs												
	9														
250.10	10														
	11														
248.10	12														
	13														
246.10	14														
	15														
244.10	16														
	17														
242.10	18														
	19														
	20														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				**A-10-B20**
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	**BUT**	**32**		**03-1202.1**
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-7-10	4-7-10	39° 44' 34.8066" / 121° 47' 18.5496" NAD83	A-10-B21
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~60.00' Lt Sta ~185+80	~2562.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	6.1 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL/CL); soft; brown; moist; some SAND; mostly fines.												
	1														
2560.00	2		IGNEOUS ROCK (BRECCIA), massive, olive gray, moderately weathered, moderately hard.												
	3														
2558.00	4														
	5				1	50/2"	REF	100							
2556.00	6		Bottom of borehole at 6.1 ft bgs												
	7														
2554.00	8														
	9														
2552.00	10														
	11														
2550.00	12														
	13														
2548.00	14														
	15														
2546.00	16														
	17														
2544.00	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B21
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 36.55" / 121° 47' 9.71" NAD83	A-10-B22
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~25.00' Lt Sta ~193+00	~286.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Diedrich D120	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY SILT with COBBLES (ML); stiff; brown; moist; about 5 to 10% COBBLES; few coarse to fine GRAVEL; some fine SAND; mostly fines; COBBLES consist of Andesite, moderately to slightly weathered, hard to very hard, subangular to subrounded [FILL].												
	1				Bag D										R
284.00	2														
	3		SANDY SILT with COBBLES (ML); stiff; brown; about 5 to 10% COBBLES; few coarse to fine GRAVEL; some fine SAND; mostly fines; COBBLES consist of Andesite, moderately to slightly weathered, hard to very hard, subangular to subrounded.												
282.00	4														
	5		Bottom of borehole at 5.0 ft bgs												
280.00	6														
	7														
278.00	8														
	9														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B22
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-7-10	4-7-10	39° 44' 37.6722" / 121° 47' 6.8784" NAD83	A-10-B23
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~60.00' Lt Sta ~195+30	~287.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	2.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); soft; brown; wet; some SAND; mostly fines.												
	1		IGNEOUS ROCK (BRECCIA), massive, olive gray, moderately weathered, moderately hard.												
285.00	2		Bottom of borehole at 2.0 ft bgs		1	50/0"	REF								
283.00	4														
281.00	6														
279.00	8														
277.00	10														
275.00	12														
273.00	14														
271.00	16														
269.00	18														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B23
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 39.21" / 121° 46' 59.12" NAD83	A-10-B24
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~25.00' Lt Sta ~201+80	~310.8 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Diedrich D120	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Poorly graded GRAVEL with SILT (GP-GM); loose to medium dense; brown; moist; mostly coarse to fine GRAVEL; few medium SAND; few fines [FILL].												
			SANDY SILT with COBBLES (ML); stiff; brown; moist to wet; about 5 to 10% COBBLES; few coarse to fine GRAVEL; some medium to fine SAND; mostly fines; COBBLES consist of Andesite, slightly weathered to fresh, hard to very hard [FILL].												
	1				Bag C										CP, CR
308.80	2				1	16	50/5	4							M, UW
						50/5"									
	3		SANDY SILT with COBBLES (ML); stiff; brown; moist to wet; about 5 to 10% COBBLES; few coarse to fine GRAVEL; some medium to fine SAND; mostly fines; COBBLES consist of Andesite, slightly weathered to fresh, hard to very hard.												
306.80	4														
	5		Bottom of borehole at 5.0 ft bgs												
304.80	6														
	7														
302.80	8														
	9														
	10														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B24
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

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LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-7-10	4-7-10	39° 44' 41.067" / 121° 46' 53.2374" NAD83	A-10-B25
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~60.00' Lt Sta ~205+30	~318.5 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			CME 55 (track)	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Std Cal (2.5")			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	12.9 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); soft to medium stiff; brown; moist; some SAND; mostly fines.												
	1		IGNEOUS ROCK (BRECCIA), massive, light olive brown, intensely to moderately weathered, moderately hard.												
316.50	2				1	50/4"	REF	100							
	3														
314.50	4														
	5				2	50/5"	REF	100							
312.50	6														
	7														
310.50	8														
	9														
308.50	10				3	50/4"	REF	100							
	11														
306.50	12														
	13		Bottom of borehole at 12.9 ft bgs		4	50/2"	REF	100							
304.50	14														
	15														
302.50	16														
	17														
300.50	18														
	19														
	20														

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B25
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 43.18" / 121° 46' 42.98" NAD83	A-10-B26
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~25.00' Lt Sta ~215+05	~349.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Diedrich D120	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		Poorly graded GRAVEL (GP); loose to medium dense; brown; moist; coarse to fine GRAVEL; little medium SAND; few fines [FILL].												
	1		SILT with SAND (ML); stiff; brown; moist to wet; little medium to fine SAND; mostly fines [FILL].		Bag B										R
347.00	2														
	3														
345.00	4														
	5		IGNEOUS ROCK (BRECCIA), very fine sand to boulder, massive, olive gray, moderately weathered, moderately soft to moderately hard [BEDROCK].												
			Bottom of borehole at 5.0 ft bgs												
343.00	6														
	7														
341.00	8														
	9														
	10														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B26
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
RCP	4-6-10	4-6-10	39° 44' 44.69" / 121° 46' 36.64" NAD83	A-10-B27
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Taber			~20.00' Lt Sta ~223+50	~368.0 ft MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			Diedrich D120	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			Automatic Hammer	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfilled with native cuttings			GW not encountered	5.0 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)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILT (ML); soft; brown; moist; few medium to fine SAND; mostly fines [FILL].												
	1				Bag A										CP
366.00	2														
	3		IGNEOUS ROCK (BRECCIA), very fine sand to boulder, massive, olive gray, moderately weathered, moderately soft to moderately hard [BEDROCK].												
364.00	4														
	5		Bottom of borehole at 5.0 ft bgs												
362.00	6														
	7														
360.00	8														
	9														
	10														

5 BR - STANDARD 1202LOGS.GPJ CALTRANS_LIBRARY_DEC09.GLB 9/20/10

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REPORT TITLE				HOLE ID
BORING RECORD				A-10-B27
DIST.	COUNTY	ROUTE	POSTMILE	EA
03	BUT	32		03-1202.1
PROJECT OR BRIDGE NAME				
State Route 32 Widening				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	RCP			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)
- Standard California Sampler
- Modified California 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)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Butte	32		03-1202.1

PROJECT OR BRIDGE NAME
State Route 32 Widening

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
			1 of 3

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

ROCK GRAPHIC SYMBOLS

IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

RQD CALCULATION (%)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - Support

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
03	Butte	32		03-1202.1

PROJECT OR BRIDGE NAME
State Route 32 Widening

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
			3 of 3

APPENDIX B:

USDA Soil Engineering Properties

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:
American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Engineering Properties– Butte Area, California, Parts of Butte and Plumas Counties												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
302—REDTOUGH-REDSWALE COMPLEX, 0 TO 2 PERCENT SLOPES												
Redtough, loam	0-1	*Loam, Gravelly loam	ML	A-7-5	0	0-10	55-100	50-100	40-95	30-75	32-47	9-14
	1-7	*Gravelly loam, Loam, very gravelly loam, cobbly loam, very cobbly loam	CL	A-6	0	0-55	50-100	45-90	40-85	30-70	29-39	12-19
	7-13	*Very cobbly loam, Loam, gravelly loam, very gravelly loam, cobbly loam	CL	A-6	0	0-55	50-100	45-90	40-85	30-70	29-39	12-19
	—	*Cemented very gravelly material	—	—	—	—	—	—	—	—	—	—
Redswale, cobbly loam	0-1	*Cobbly loam, Loam, gravelly loam, very cobbly loam	ML	A-6	0	0-55	75-95	70-90	60-85	40-70	29-42	9-15
	1-7	*Very cobbly loam, Cobbly loam, very gravelly loam, gravelly loam	CL	A-6	0	0-50	50-95	45-90	40-85	30-70	29-41	12-19
	—	*Cemented very gravelly material	—	—	—	—	—	—	—	—	—	—

Engineering Properties– Butte Area, California, Parts of Butte and Plumas Counties												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
418—ALMENDRA LOAM, 0 TO 1 PERCENT SLOPES												
Almendra, loam	0-4	*Loam, Fine sandy loam	ML	A-7-6	0	0	95-100	90-100	65-95	35-75	30-47	9-18
	4-14	*Loam, Fine sandy loam	CL	A-7-6	0	0	95-100	90-100	65-95	35-75	30-47	9-18
	14-29	*Loam, Fine sandy loam	CL	A-6	0	0	95-100	90-100	65-95	35-75	29-42	11-19
	29-40	*Loam, Fine sandy loam	CL	A-6	0	0	95-100	90-100	65-95	35-75	29-42	11-19
	40-52	*Loam, Fine sandy loam	CL	A-4	0	0	95-100	90-100	65-95	35-75	26-39	9-19
	52-74	*Very fine sandy loam, Loam, fine sandy loam, sandy loam	CL	A-4	0	0	95-100	90-100	55-95	25-75	22-36	7-17
	74-86	*Very fine sandy loam, Fine sandy loam, loam, sandy loam	CL	A-4	0	0	95-100	90-100	55-95	25-75	22-36	7-17

Engineering Properties– Butte Area, California, Parts of Butte and Plumas Counties												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
425—VINA FINE SANDY LOAM, 0 TO 1 PERCENT SLOPES												
Vina, fine sandy loam	0-3	*Fine sandy loam, Loam	ML	A-4	0	0	95-100	90-100	65-95	35-75	27-40	7-13
	3-11	*Fine sandy loam, Loam	CL	A-4	0	0	95-100	90-100	65-95	35-75	27-40	7-13
	11-23	*Sandy loam, Fine sandy loam, loam	SC	A-4	0	0	95-100	90-100	55-95	25-75	22-33	6-12
	23-37	*Sandy loam, Loam, fine sandy loam	SC-SM	A-2-4	0	0	95-100	90-100	55-95	25-75	22-33	6-12
	37-50	*Sandy loam, Loam, fine sandy loam, coarse sand, loamy coarse sand, loamy sand	SM	A-2-4	0	0	95-100	90-100	45-95	5-75	0-27	NP-9
	50-54	*Loamy coarse sand, Sandy loam, loam, coarse sand, fine sandy loam, loamy sand	SM	A-2-4	0	0	95-100	90-100	45-95	5-75	0-27	NP-9
	54-80	*Coarse sand, Sandy loam, loam, fine sandy loam, loamy coarse sand, loamy sand	SM	A-2-4	0	0	95-100	90-100	45-95	5-75	0-27	NP-9

Engineering Properties– Butte Area, California, Parts of Butte and Plumas Counties												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
615—DOEMILL-JOKERST COMPLEX, 3 TO 8 PERCENT SLOPES												
Doemill, gravelly loam	0-1	*Gravelly loam, Loam	ML	A-4	0-15	0-15	80-100	75-98	60-93	45-74	32-47	9-16
	1-5	*Gravelly loam, Cobbly loam, gravelly clay loam, loam, very gravelly clay loam	CL	A-6	0-15	0-30	75-100	70-96	60-96	40-76	29-42	12-21
	5-9	*Gravelly loam, Loam, cobbly loam, gravelly clay loam, very gravelly clay loam	CL	A-6	0-15	0-30	75-100	70-96	60-96	40-76	29-42	12-21
	9-14	*Gravelly loam, Loam, cobbly loam, gravelly clay loam, very gravelly clay loam	CL	A-6	0-15	0-30	75-100	70-96	60-96	40-76	29-42	12-21
	—	*Bedrock	—	—	—	—	—	—	—	—	—	—
Jokerst, very cobbly loam	0-1	*Very cobbly loam, Gravelly loam, very cobbly loam, very stony loam, stony loam, cobbly loam	ML	A-4	0-45	15-55	65-90	60-85	50-80	35-65	27-42	7-14
	1-4	*Gravelly loam, Cobbly loam, loam	CL	A-6	0-15	0-30	65-90	60-85	50-80	35-65	27-39	10-17
	—	*Bedrock	—	—	—	—	—	—	—	—	—	—

Data Source Information

Soil Survey Area: Butte Area, California, Parts of Butte and Plumas Counties
Survey Area Data: Version 9, Jun 2, 2009

APPENDIX C:

Laboratory Summary Sheet and Test Results

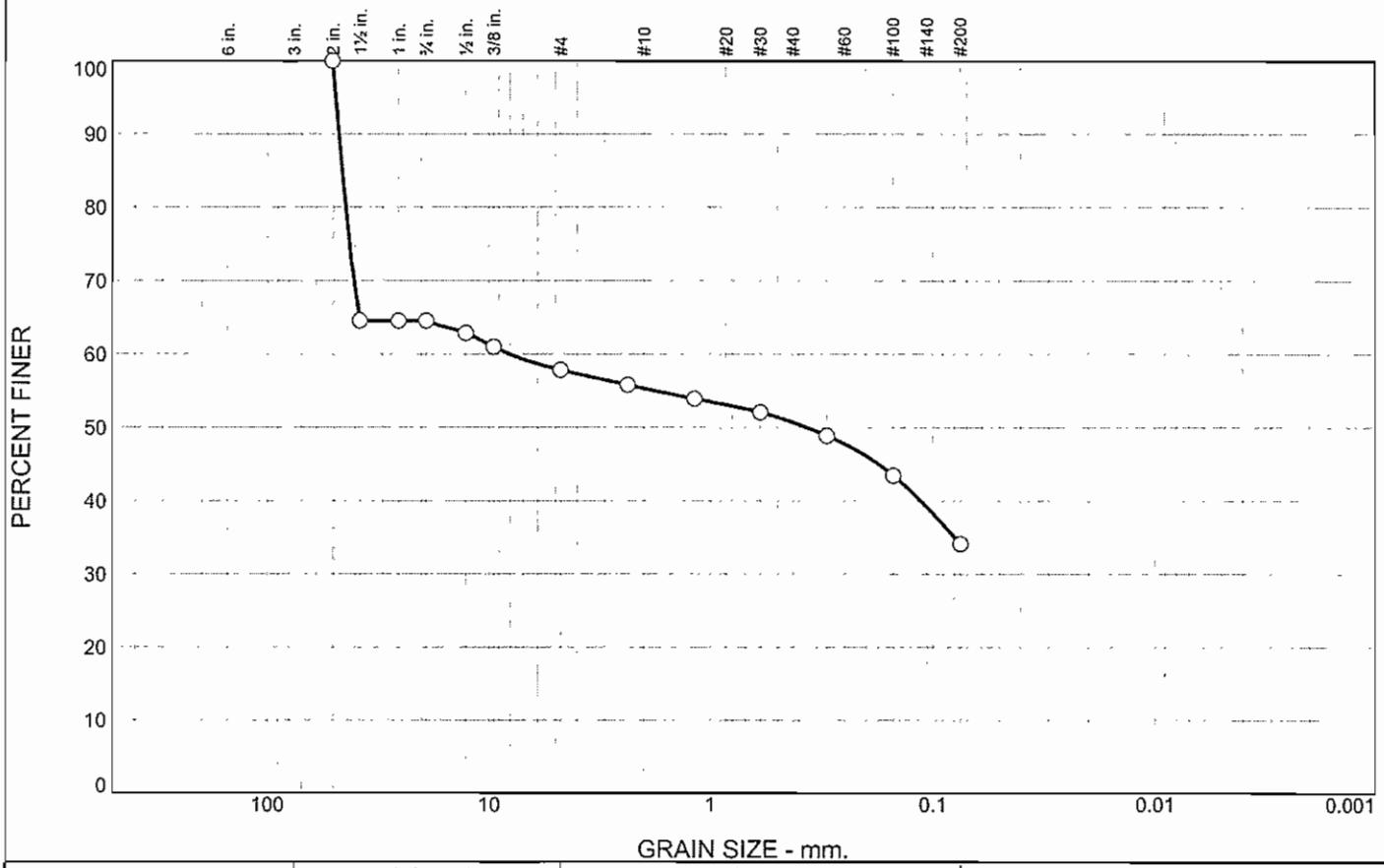
Laboratory Test Summary **1202.2**

Samples from Exploratory Borings

SR32 Widening

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Total Phi (degrees)	Cohesion (psf)	CTM 216		Corrosivity Test			
																% moisture	max dry density (pcf)	pH	Resistivity ohm-cm	Chlorides ppm	Sulfates ppm
Geotechnical Borings																					
A-10-B3	BagO	1.0-5.0	CL			23	36	13													
A-10-B3	1c	3.0-3.5		87.3	25.4							0.5									
A-10-B3	2c	6.0-6.5		91.8	26.6				42	24	34		0.31								
A-10-B3	2b/c	10.5-11.5		120.6	16.7							0.3									
A-10-B4	1c	2.5-3.0		97.5	25.9							0.2									
A-10-B4	2c	4.0-4.4		106.1	15.1							1.8									
A-10-B17	Bag H	0.5-5.0	SC			22	36	14	13	41	46					12.7	126.3				
A-10-B17	1c	3.0-3.5		104.1	23.5							1.5-4.25		28	315						
A-10-B17	2b/c	5.0-5.35	CL						0	38	63										
A-10-B17	3c	10.5-11.0		80.3	42.9							4.5+									
A-10-B19	BagE	1.0-8.0		123.0	14.8									29	315	14	124.8	6.5	5360	7.5	9.1
A-10-B19	1b/c	2.0-3.5	SC	96.1	25.7	18	27	9	11	46	43		0.57								
A-10-B19	2c	11.0-11.5		82.4	26.6							1.25-2.25									
A-10-B20	Bag F	1.0-6.0	SC			21	32	11	12	49	38										
A-10-B20	1c	3.0-3.5		93.0	12.6							3.5									
Soundwall Borings																					
A-10-B5	1c	3.0-3.5		128.5	23.3							0.2									
A-10-B5	2b/c	5.5-6.5	ML	133.0	12.8				4	38	58										
A-10-B5	4c	16.0-16.5		129.7	15.7																
A-10-B6	2b	6.0-6.5	CL-ML	106.0	11.1	20	26	6				2.0									
A-10-B6	3c	11-11.5		102.5	11.8																
A-10-B7	1c	6-6.5		87.9	30.8								0.35								
A-10-B9	1b/c	2.5-3.5		79.2	35.9	26	40	14													
A-10-B9	2b/c	5.5-6.0	SM	87.0	32.1				0	55	45										
A-10-B10	1c	3.0-3.5				29	41	12													
A-10-B10	2c	6.0-6.5											0.36								
A-10-B10	3c	11.0-11.5		87.0	30.5																
A-10-B10	4b/c	15.5-16.5	GW	142.3	9.8				63	31	7										
A-10-B12	2c	6-6.5		90.4	28.2								0.87								
A-10-B12	3c	11.0-11.5		123.3	14.9																
A-10-B12	4c	16.0-16.5		140.9	8.9																
A-10-B13	1b/c	2.5-3.5	SC	75.4	29.5	22	40	18			31										
A-10-B13	2b	5.5-6.0	SC						1	69	31										
A-10-B13	3c	11.0-11.5		85.9	34.7							0.8									
A-10-B15	1c	3.0-3.5		96.2	24.5							2.8-3.5									
A-10-B15	3c	11.0-11.5		85.3	36.2							1.0-2.0									
A-10-B25	1c	2-2.33		74.7	23.9																
Material Borings																					
A-10-B8	Bag J	1.0-5.0														12.4	124.4	6.98	3750	5.9	18.4
A-10-B14	Bag M	0.0-5.0														8.3	133.8	6.13	8310	10.7	0.4
A-10-B24	Bag C	1.0-5.0														11.4	127.8	6.78	4290	6.7	4.9
A-10-B27	Bag A	0.5-5.0														12.3	124.6				

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	35.4	6.7	2.5	4.7	16.6	34.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1.5"	64.6		
1"	64.6		
3/4"	64.6		
1/2"	62.9		
3/8"	61.0		
#4	57.9		
#8	55.8		
#16	53.9		
#30	52.1		
#50	48.9		
#100	43.5		
#200	34.1		

* (no specification provided)

Material Description

Very dark brown Silty Gravel with Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 47.5157 D_{85}= 45.8923 D_{60}= 8.0746
D_{50}= 0.3681 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO=

Remarks

Sample Number: A-10-B3-3C **Depth:** 11.0'-11.5'

Date: 5/4/10

Blackburn Consulting

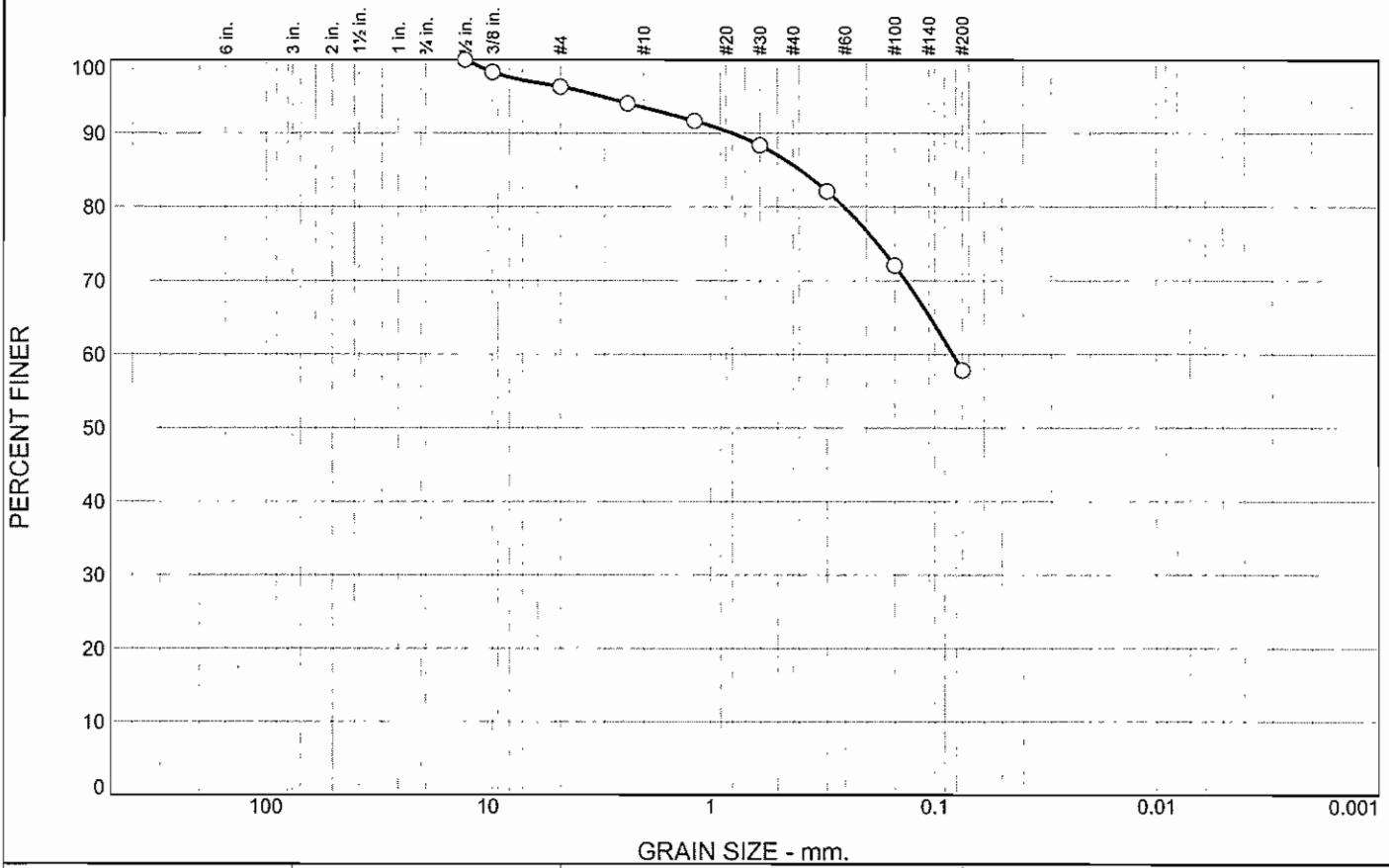
Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening

Project No: 1202.1 **Figure**

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

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.7	2.8	7.8	27.8	57.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.3		
#4	96.3		
#8	94.1		
#16	91.7		
#30	88.4		
#50	82.1		
#100	72.1		
#200	57.9		

* (no specification provided)

Material Description

Dark brown Sandy SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7980 D_{85}= 0.3941 D_{60}= 0.0828
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample Number: A-10-B5-2B **Depth:** 5.5'-6.0'

Date: 5/4/10

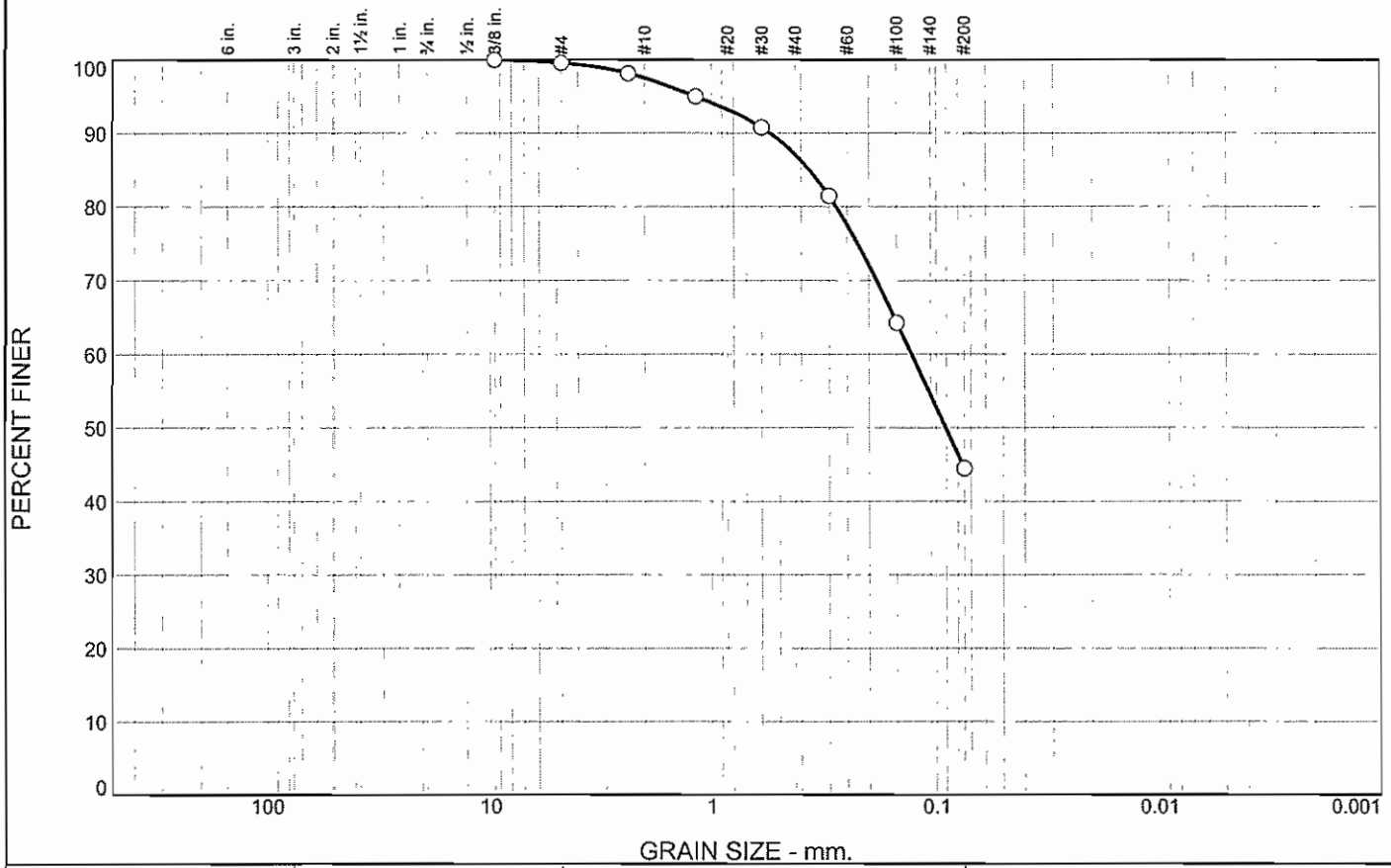
Blackburn Consulting

Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening
Project No: 1202.1 **Figure**

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

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	2.1	10.4	42.6	44.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.6		
#8	98.1		
#16	95.0		
#30	90.8		
#50	81.5		
#100	64.3		
#200	44.5		

* (no specification provided)

Material Description

Very Dark Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5503 D_{85}= 0.3668 D_{60}= 0.1289
D_{50}= 0.0909 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: A-10-B9-2B **Depth:** 5.5'-6.0'

Date: 5/4/10

Blackburn Consulting

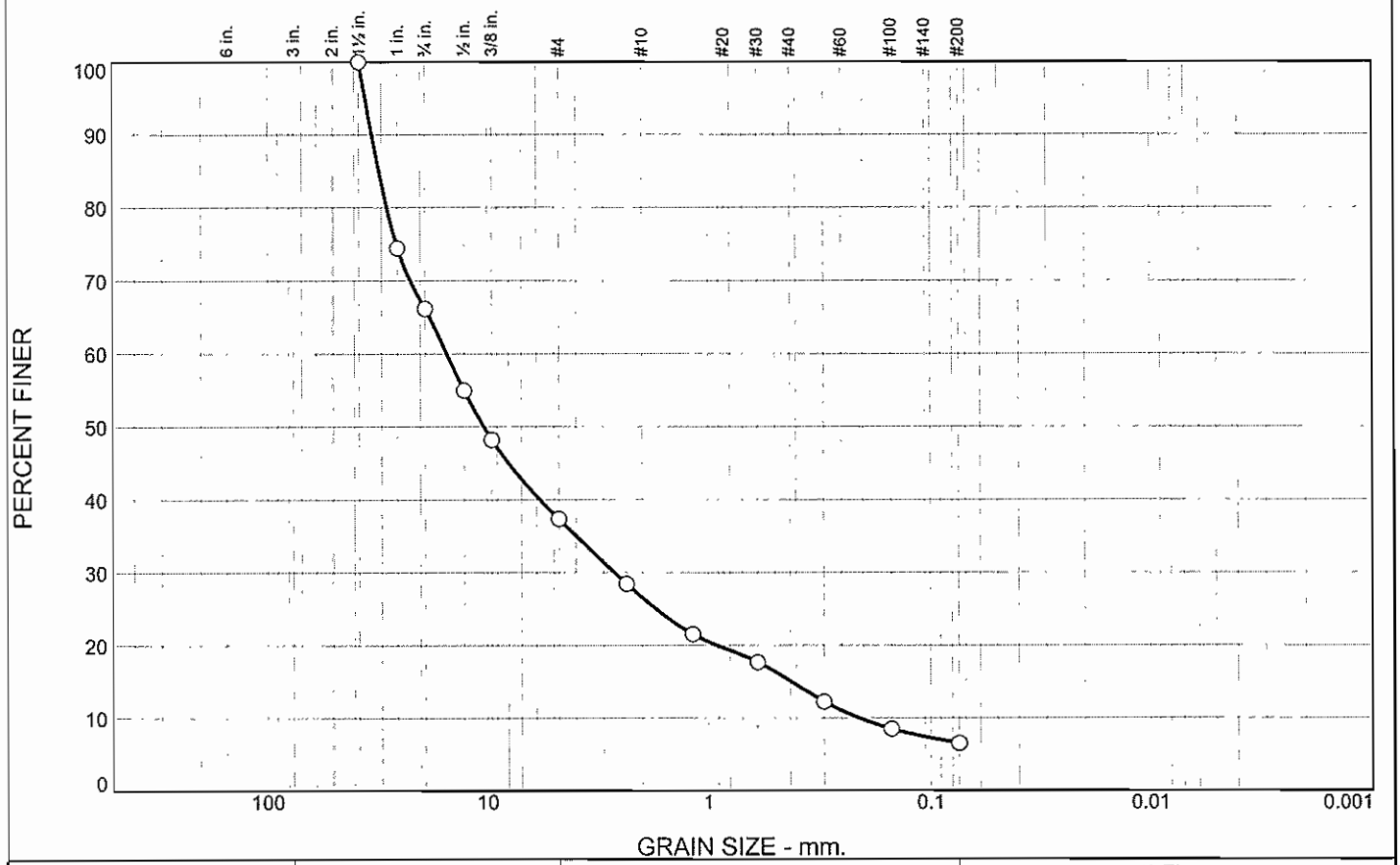
Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening

Project No: 1202.1 **Figure**

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

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	33.8	28.9	10.8	11.5	8.5	6.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	74.5		
3/4"	66.2		
1/2"	55.0		
3/8"	48.2		
#4	37.3		
#8	28.5		
#16	21.5		
#30	17.7		
#50	12.2		
#100	8.5		
#200	6.5		

* (no specification provided)

Material Description

Brown Well Graded Gravel with Silt and Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 33.1667 D_{85}= 30.7945 D_{60}= 15.1971
D_{50}= 10.3564 D_{30}= 2.6767 D_{15}= 0.4225
D_{10}= 0.2102 C_u= 72.31 C_c= 2.24

Classification

USCS= AASHTO=

Remarks

Sample Number: A-10-B10-4B **Depth:** 15.5'-16.0'

Date: 5/3/10

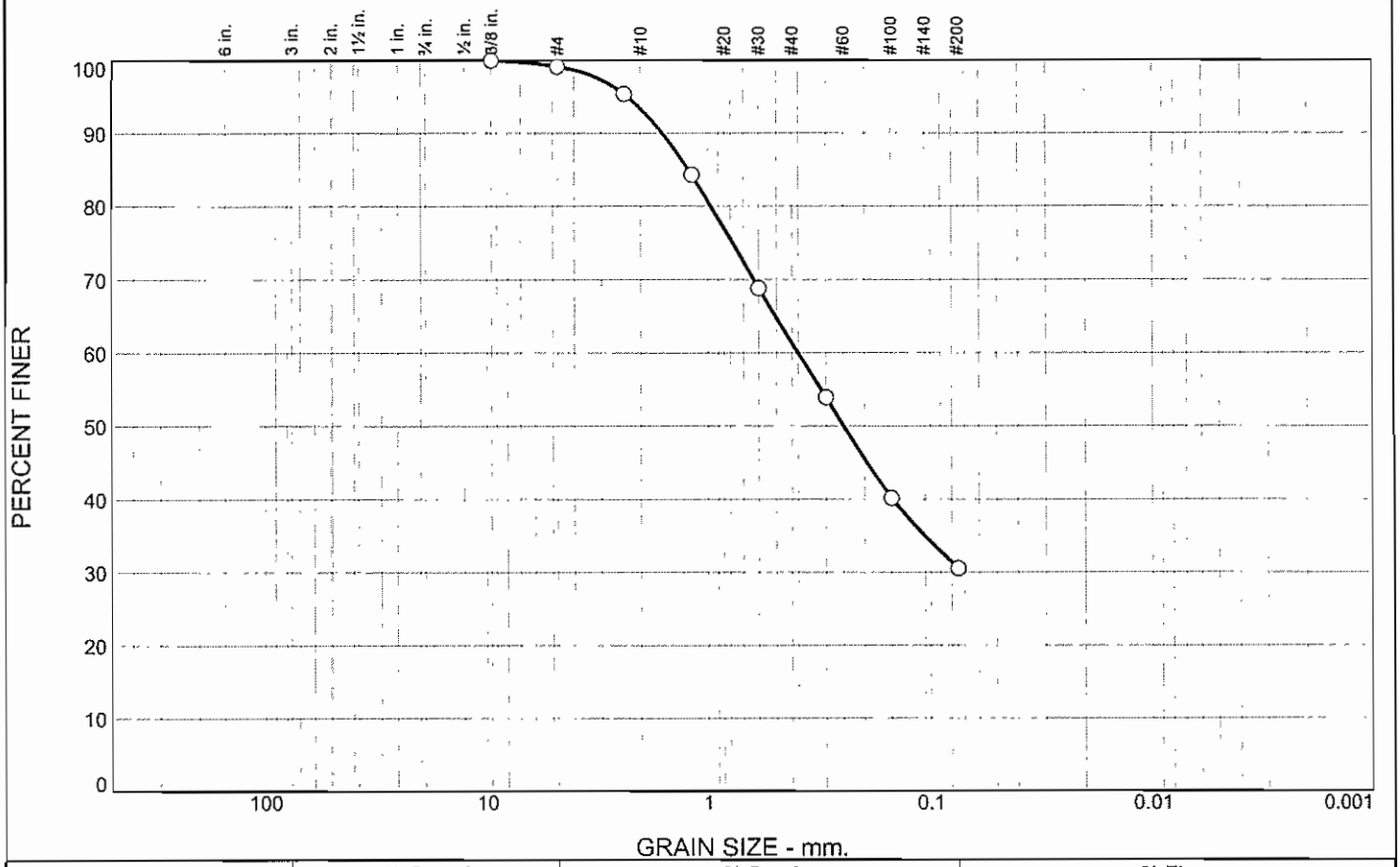
Blackburn Consulting

Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening
Project No: 1202.1 **Figure**

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

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	5.7	32.1	30.8	30.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.1		
#8	95.4		
#16	84.3		
#30	68.8		
#50	53.9		
#100	40.2		
#200	30.5		

* (no specification provided)

Material Description

Dark Brown Clayey SAND

Atterberg Limits

PL= 22 LL= 40 PI= 18

Coefficients

D_{90}= 1.5918 D_{85}= 1.2188 D_{60}= 0.4003
D_{50}= 0.2489 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Sample Number: A-10-B13-2B **Depth:** 5.5'-6.0'

Date: 5-3-10

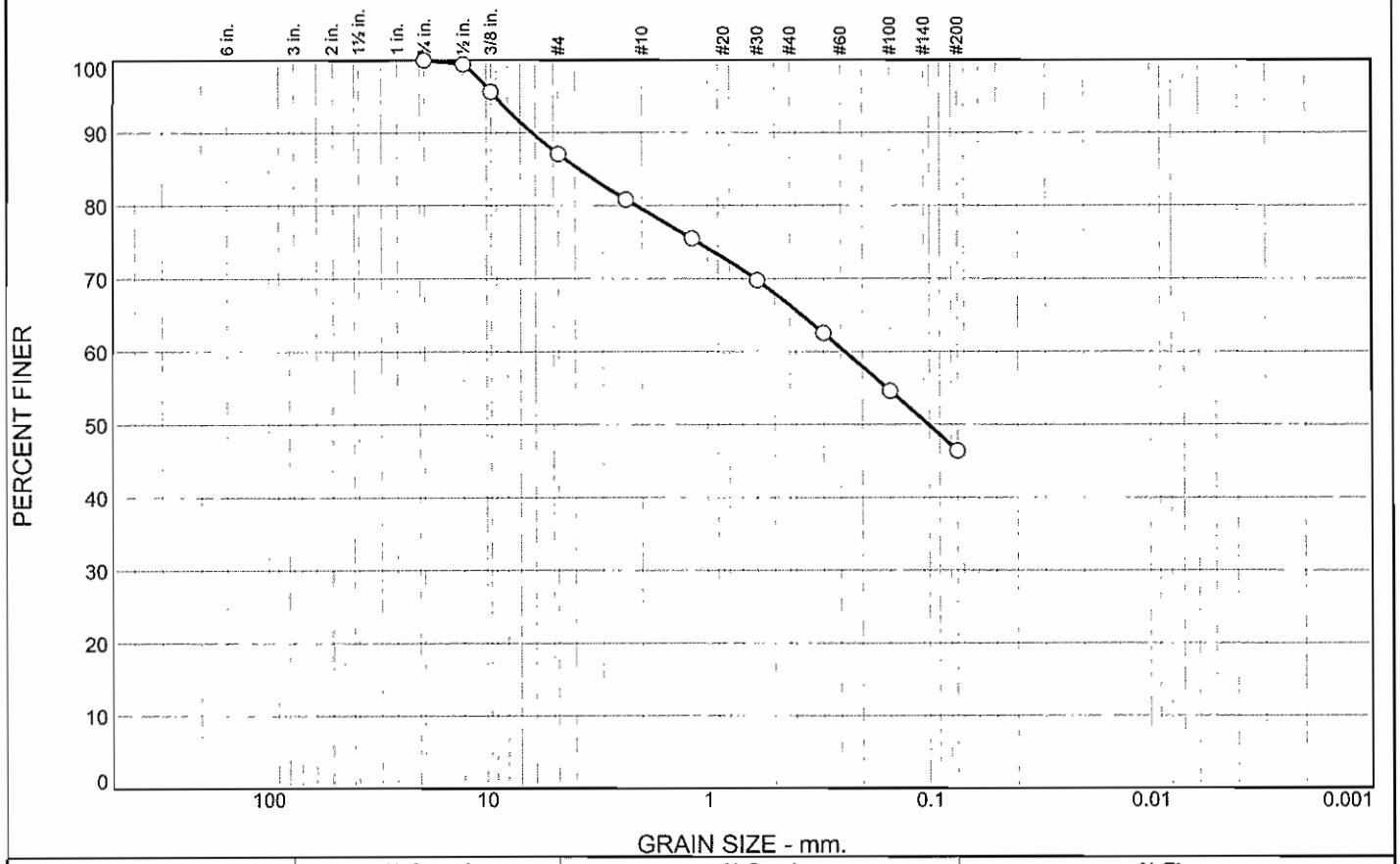
Blackburn Consulting

Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening
Project No: 1202.1 **Figure**

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

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.9	7.5	13.3	19.9	46.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	99.4		
3/8"	95.6		
#4	87.1		
#8	80.9		
#16	75.5		
#30	69.8		
#50	62.5		
#100	54.6		
#200	46.4		

* (no specification provided)

Material Description

Brown Clayey SAND

Atterberg Limits

PL= 22 LL= 36 PI= 14

Coefficients

D_{90}= 6.2116 D_{85}= 3.8335 D_{60}= 0.2394
D_{50}= 0.1013 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

Sample Number: A-10-B17 Bag H **Depth:** 0.5'-5.0'

Date: 4-15-10

Blackburn Consulting

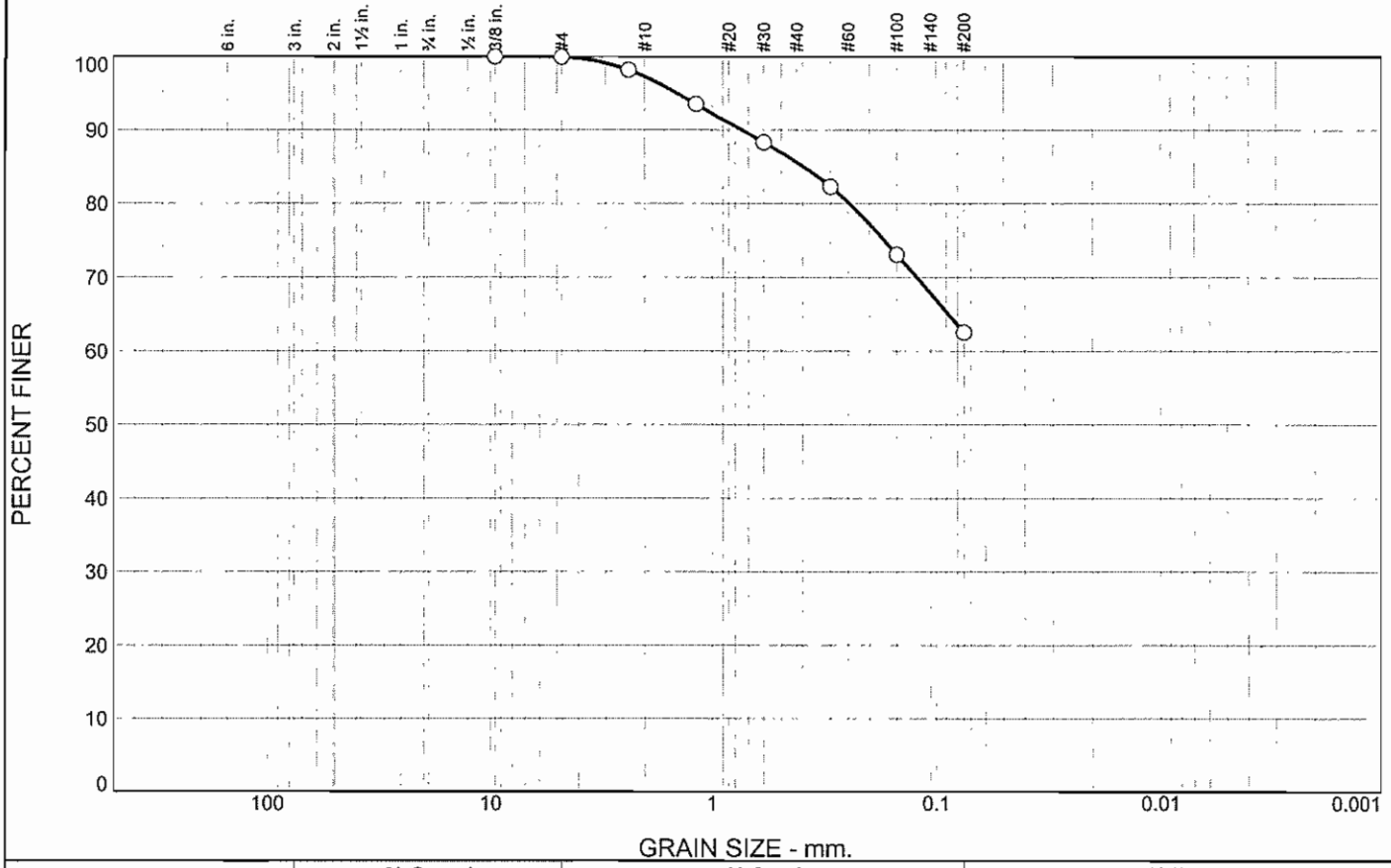
Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening

Project No: 1202.1 **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	2.7	11.7	23.1	62.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#8	98.2		
#16	93.5		
#30	88.3		
#50	82.3		
#100	73.1		
#200	62.5		

* (no specification provided)

Material Description

Brown Sandy Lean CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7474 D_{85}= 0.3954 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample Number: A-10-B17-2B **Depth:** 10.0'-10.5'

Date: 4-15-10

Blackburn Consulting

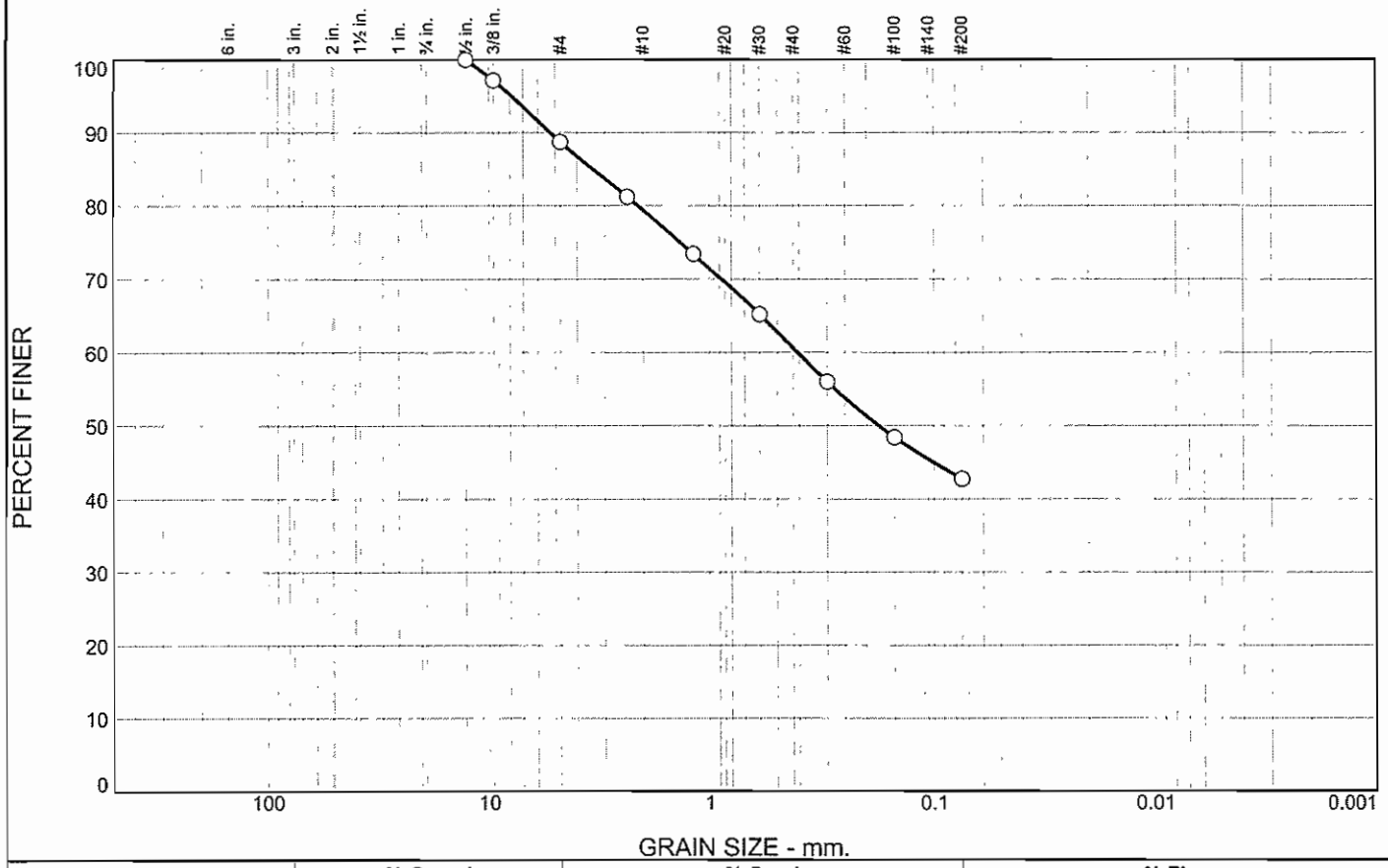
Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening

Project No: 1202.1 **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	11.3	9.3	18.8	17.9	42.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	97.2		
#4	88.7		
#8	81.2		
#16	73.4		
#30	65.2		
#50	56.0		
#100	48.4		
#200	42.7		

* (no specification provided)

Material Description

Brown Clayey SAND

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{90}= 5.2803 D_{85}= 3.3889 D_{60}= 0.4065
D_{50}= 0.1763 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

Sample Number: A10-B19-1B **Depth:** 5.5'-6.0'

Date: 4-15-10

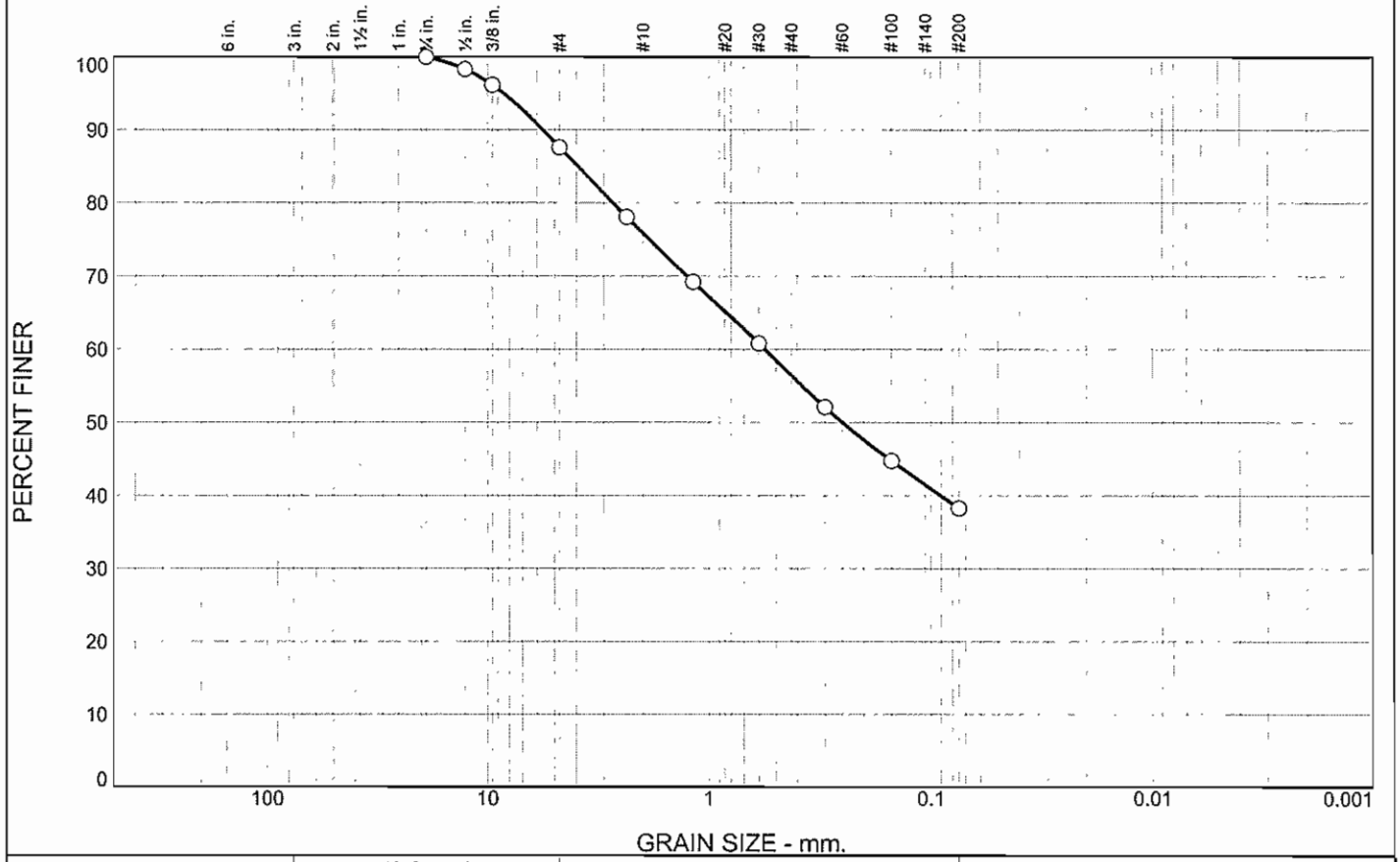
Blackburn Consulting

Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening
Project No: 1202.1 **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	12.4	11.7	19.5	18.1	38.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.3		
3/8"	96.2		
#4	87.6		
#8	78.1		
#16	69.2		
#30	60.8		
#50	52.1		
#100	44.8		
#200	38.3		

* (no specification provided)

Material Description

Brown Clayey SAND

Atterberg Limits

PL= 21 LL= 32 PI= 11

Coefficients

D_{90}= 5.6554 D_{85}= 3.9308 D_{60}= 0.5621
D_{50}= 0.2492 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

Remarks

Sample Number: A-10-B20 Bag F **Depth:** 1.0'-6.0'

Date: 4-15-10

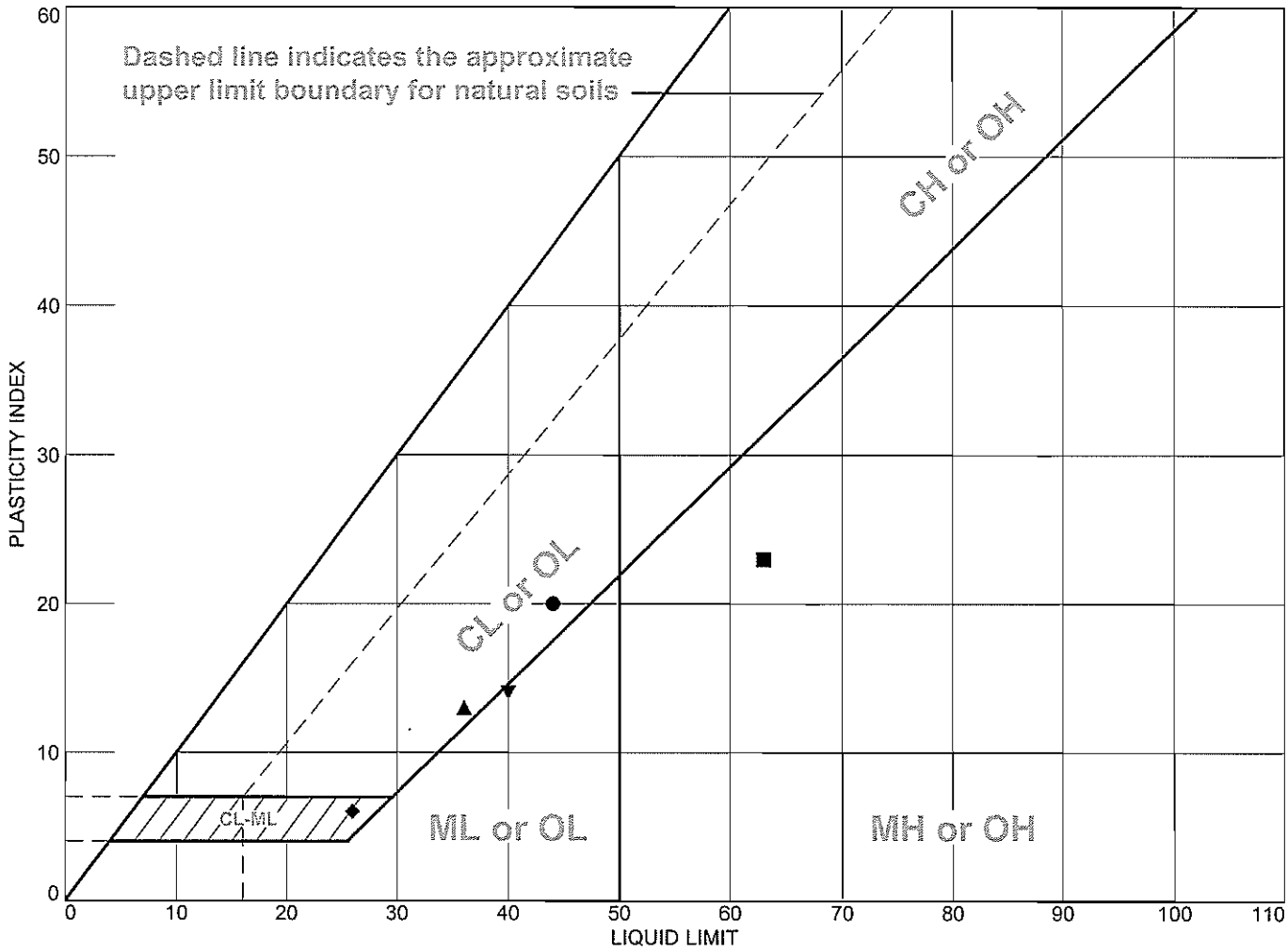
Blackburn Consulting

Auburn, CA

Client: Mark Thomas Company
Project: SR 32 Widening
Project No: 1202.1 **Figure**

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

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dark Brown Lean CLAY	44	24	20			CL
■	Strong Brown Elastic SILT	63	40	23			MH
▲	Very Dark Brown Lean CLAY	36	23	13			CL
◆	Dark Brown Silty CLAY	26	20	6			CL-ML
▼	Very Dark Brown SILT	40	26	14			ML

Project No. 1202.1 **Client:** Mark Thomas Company

Project: SR 32 Widening

Remarks:

● **Depth:** 5.5'-6.0' **Sample Number:** A-10-B1-2B
■ **Depth:** 31.0'-31.5' **Sample Number:** A-10-B2-7C
▲ **Depth:** 1.0'-5.0' **Sample Number:** A-10-B3 Bag O
◆ **Depth:** 5.5'-6.0' **Sample Number:** A-10-B6-2B
▼ **Depth:** 2.5'-3.0' **Sample Number:** A-10-B9-1B

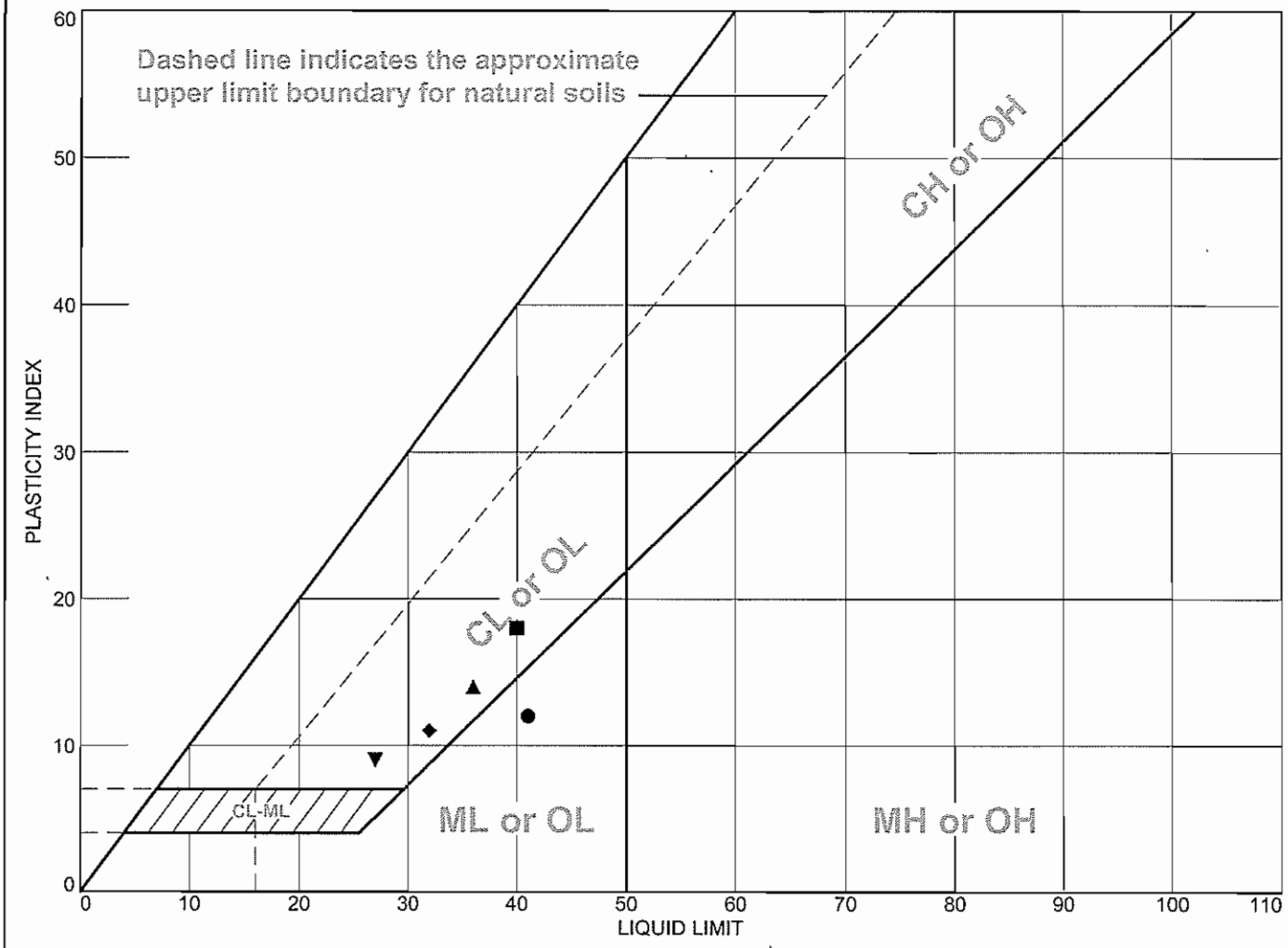
Blackburn Consulting

Auburn, CA

Figure

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

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Brown SILT	41	29	12			ML
■	Dark Brown Clayey SAND	40	22	18	61.3	30.5	SC
▲	Brown Clayey SAND	36	22	14	66.3	46.4	SC
◆	Brown Clayey SAND	32	21	11	56.4	38.3	SC
▼	Brown Clayey SAND	27	18	9	60.6	42.7	SC

Project No. 1202.1 **Client:** Mark Thomas Company

Project: SR 32 Widening

● **Depth:** 3.0'-3.5' **Sample Number:** A-10-B10-1C
■ **Depth:** 5.5'-6.0' **Sample Number:** A-10-B13-2B
▲ **Depth:** 0.5'-5.0' **Sample Number:** A-10-B17 Bag H
◆ **Depth:** 1.0'-6.0' **Sample Number:** A-10-B20 Bag F
▼ **Depth:** 5.5'-6.0' **Sample Number:** A-10-B19-1B

Blackburn Consulting

Auburn, CA

Remarks:
● Organic smell
■ Organics (wood pieces) and voids in sample

Figure

Tested By: ○ KLC □ KLC △ KLD ◇ KLC **Checked By:** KLC

Unconfined Compression Test
ASTM D 2166-06

Project Name: SR 32 Widening
Project Number: 1202.2
Sample: A-10-B3, 2c Depth: 6.0-6.5'
Sample Description: Lean CLAY with organics, black
Date: 4/26/2010
Tested By: MAR/BWM

Original Sample Length	5.79
Original Diameter (in)	2.41
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.56

Test Results

Axial Strain at Max. Load	7.3%
Average cross-sectional area (in^2)	4.92
Deflection at Max. Load (in)	0.424
Maximum Load (lbs)	21
Strain at Failure (%)	2.45
Compressive Strength (tsf)	**0.31**

Moisture Density

Tube and Sample (g)	1090.80
Tube (g)	285.60
Sample Weight (g)	805.20
Tare Number	A1
Tare Weight (g)	154.90
Wet Weight (g)	502.30
Dry Weight (g)	429.40
Dry Weight (g)	274.50
Water Weight (g)	72.90
Percent Moisture (%)*	26.6
Wet Density (pcf)	116.2
Dry Density (pcf)	91.8

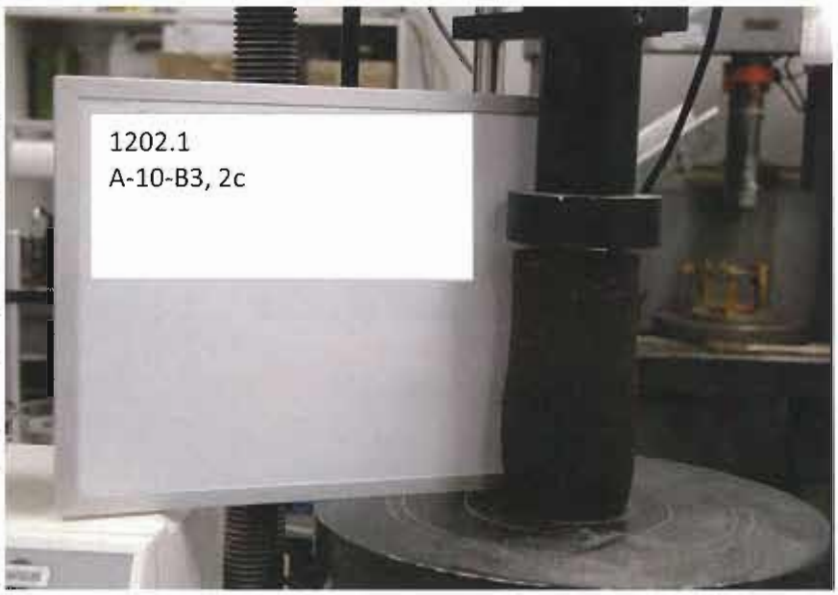
Compression Tests

Dial reading @ 0 lb	0.000

Rate of Strain=0.056in/min

Remarks:

* % moisture taken after test.

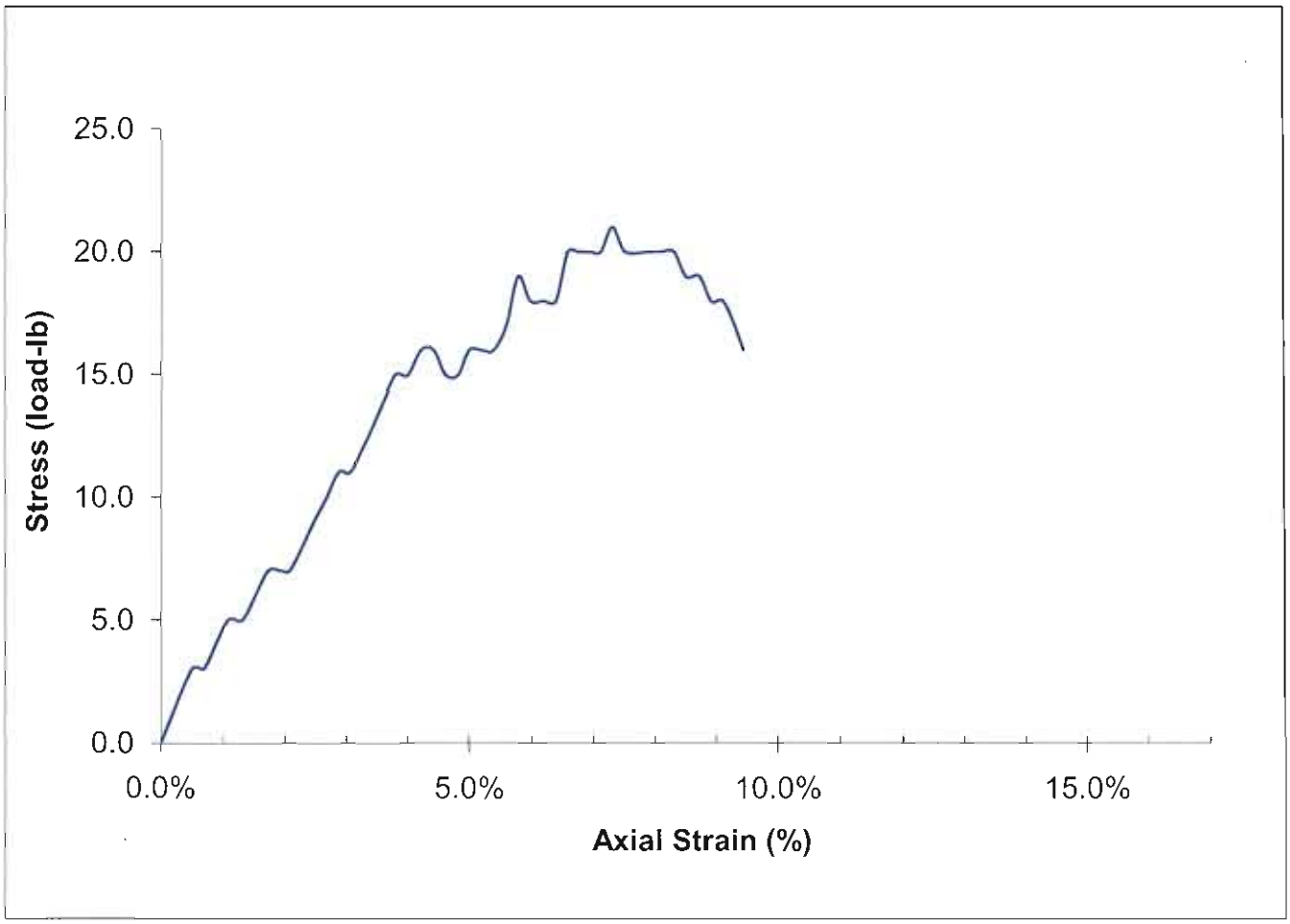


Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.029	3	0.210	14	0.392	20		
0.040	3	0.221	15	0.403	20		
0.051	4	0.233	15	0.413	20		
0.063	5	0.245	16	0.424	21		
0.076	5	0.257	16	0.436	20		
0.088	6	0.268	15	0.459	20		
0.100	7	0.280	15	0.470	20		
0.111	7	0.290	16	0.482	20		
0.120	7	0.302	16	0.493	19		
0.132	8	0.313	16	0.506	19		
0.143	9	0.325	17	0.517	18		
0.155	10	0.336	19	0.528	18		
0.166	11	0.347	18	0.539	17		
0.177	11	0.359	18	0.547	16		
0.189	12	0.371	18				
0.200	13	0.382	20				

Project
SR 32 Widening
Project Number
1202.2
Sample Number
A-10-B3, 2c
Material Description
Lean CLAY with organics, black
Tested By
MAR/BWM

ASTM D 2166-06



Wet Density (pcf)	116.2
Dry Density (pcf)	91.8
% Moisture	26.6

Unconfined Compressive Strength (tsf)	0.31

Unconfined Compression Test
ASTM D 2166-06

Project Name: SR 32 Widening
Project Number: 1202.2
Sample: A-10-B7, 1c Depth: 3.0-3.5
Sample Description: SANDY lean CLAY, very dark brown
Date: 4/27/2010
Tested By: BWM

Original Sample Length	5.88
Original Diameter (in)	2.41
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.56

Test Results

Axial Strain at Max. Load	8.6%
Average cross-sectional area (in^2)	4.99
Deflection at Max. Load (in)	0.507
Maximum Load (lbs)	24
Strain at Failure (%)	2.98
Compressive Strength (tsf)	**0.35**

Moisture Density

Tube and Sample (g)	1081.70
Tube (g)	272.20
Sample Weight (g)	809.50
Tare Number	B6
Tare Weight (g)	154.10
Wet Weight (g)	559.60
Dry Weight (g)	464.04
Dry Weight (g)	309.94
Water Weight (g)	95.56
Percent Moisture (%)*	30.8
Wet Density (pcf)	115.0
Dry Density (pcf)	87.9

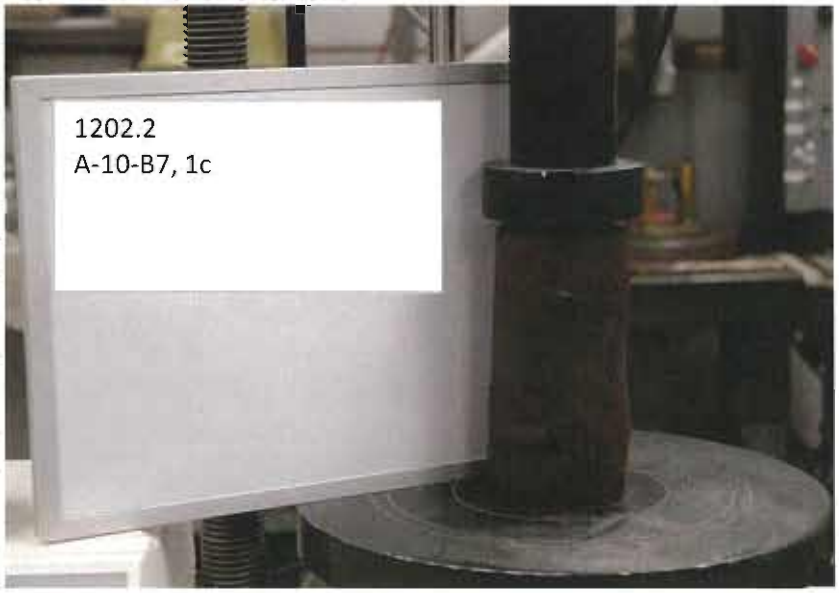
Compression Tests

Dial reading @ 0 lb	0.000

Rate of Strain=0.056in/min

Remarks:

* % moisture taken after test.

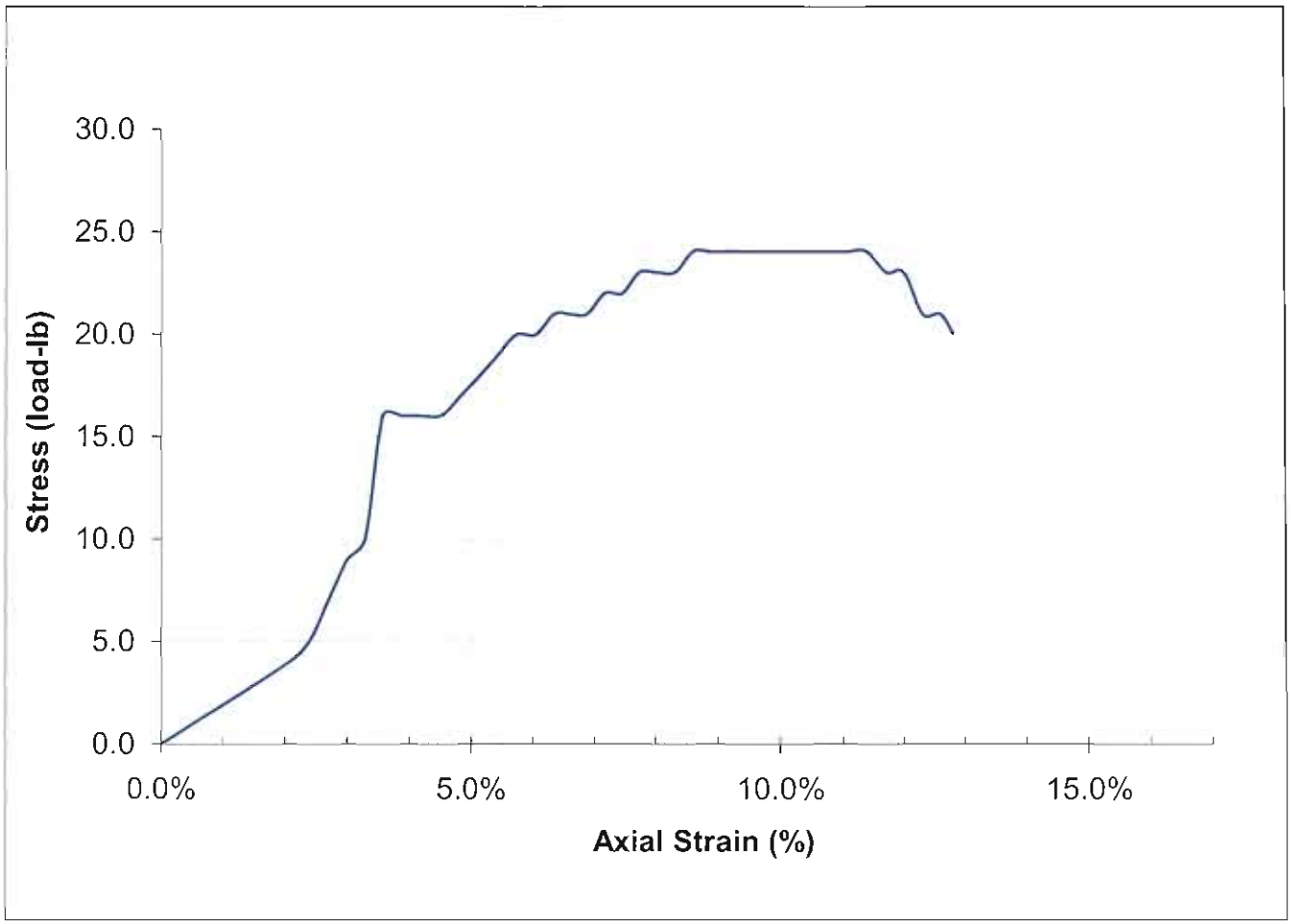


Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.122	4	0.406	21	0.670	24		
0.141	5	0.423	22	0.689	23		
0.159	7	0.440	22	0.706	23		
0.177	9	0.456	23	0.724	21		
0.194	10	0.472	23	0.741	21		
0.211	16	0.490	23	0.754	20		
0.229	16	0.507	24				
0.247	16	0.522	24				
0.266	16	0.541	24				
0.285	17	0.557	24				
0.304	18	0.573	24				
0.321	19	0.587	24				
0.339	20	0.603	24				
0.357	20	0.620	24				
0.374	21	0.635	24				
0.390	21	0.652	24				

Project
SR 32 Widening
Project Number
1202.2
Sample Number
A-10-B7, 1c
Material Description
SANDY lean CLAY, very dark brown
Tested By
BWM

ASTM D 2166-06



Wet Density (pcf)	115.0
Dry Density (pcf)	87.9
% Moisture	30.8

Unconfined Compressive Strength (tsf)	0.35

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: SR 32 Widening
Project Number: 1202.2
Sample: A-10-B10, 2c Depth: 6-6.5
Sample Description: Lean CLAY, very dark brown
Date: 4/27/2010
Tested By: BWM

Original Sample Length	5.98
Original Diameter (in)	2.40
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.52

Test Results

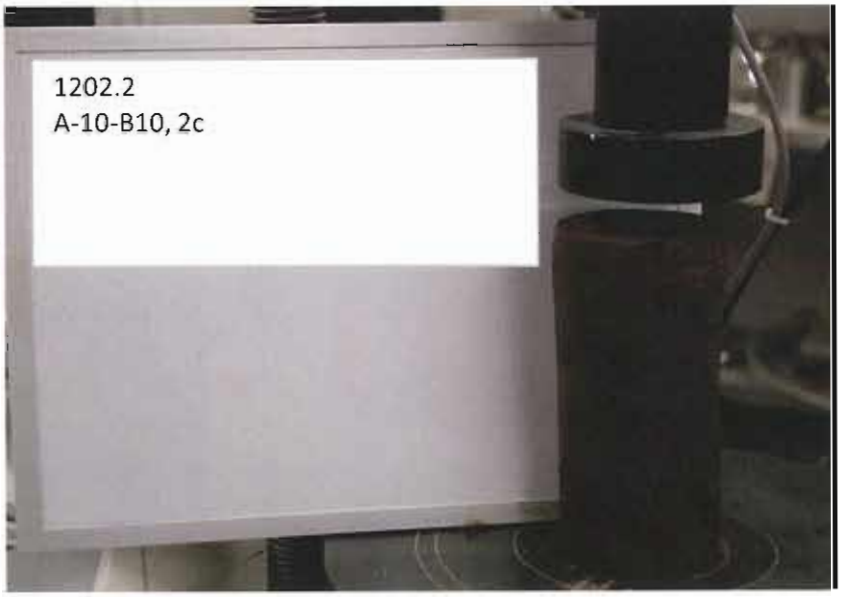
Axial Strain at Max. Load	7.0%
Average cross-sectional area (in^2)	4.86
Deflection at Max. Load (in)	0.416
Maximum Load (lbs)	24
Strain at Failure (%)	2.49
Compressive Strength (tsf)	**0.36**

Moisture Density

Tube and Sample (g)	
Tube (g)	
Sample Weight (g)	
Tare Number	
Tare Weight (g)	
Wet Weight (g)	
Dry Weight (g)	
Dry Weight (g)	0.00
Water Weight (g)	0.00
Percent Moisture (%)*	#DIV/0!
Wet Density (pcf)	0.0
Dry Density (pcf)	#DIV/0!

Remarks:

* % moisture taken after test.



Compression Tests

Dial reading @ 0 lb	0.000

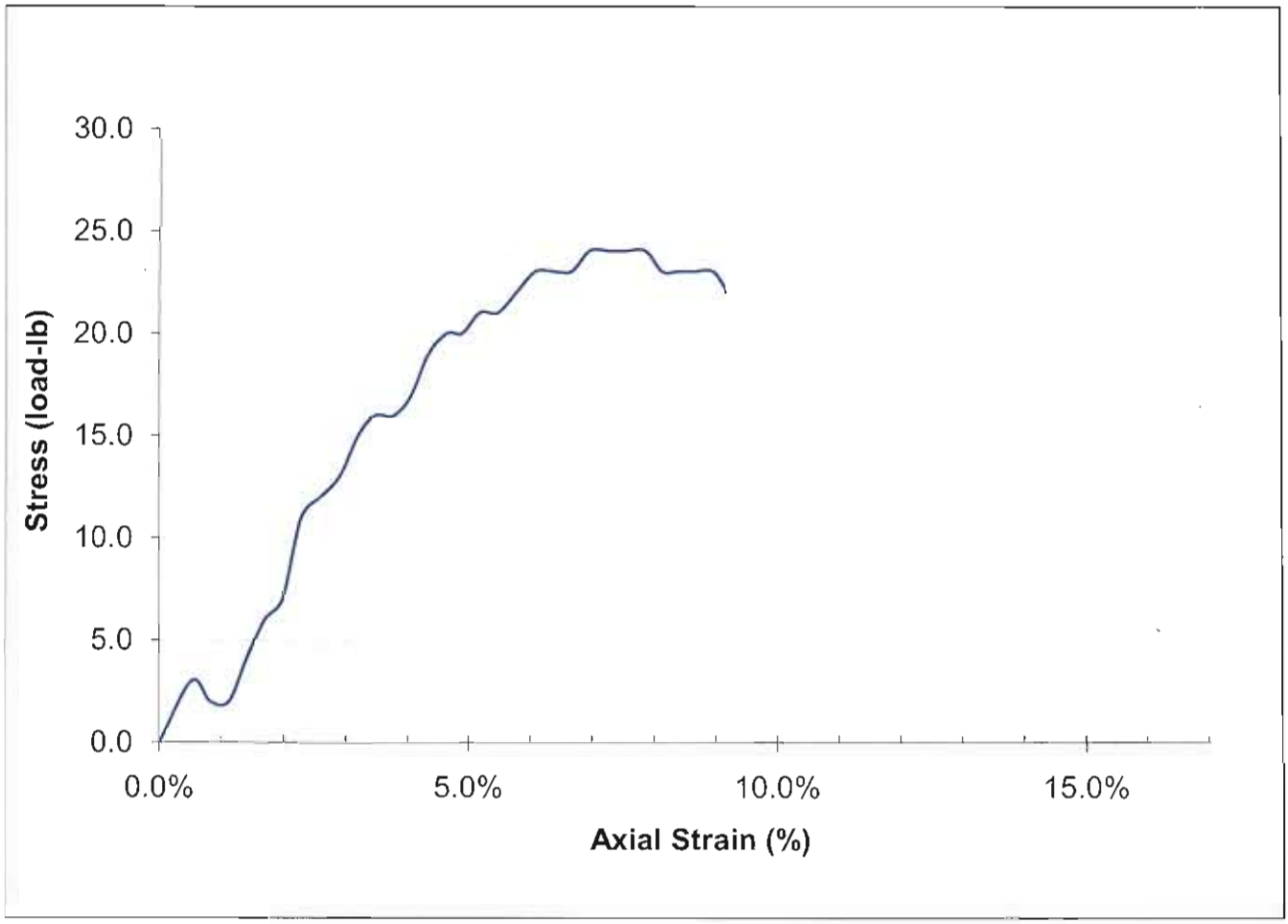
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.031	3	0.310	21				
0.049	2	0.328	21				
0.067	2	0.346	22				
0.083	4	0.364	23				
0.101	6	0.381	23				
0.118	7	0.399	23				
0.136	11	0.416	24				
0.155	12	0.435	24				
0.173	13	0.452	24				
0.191	15	0.470	24				
0.208	16	0.486	23				
0.226	16	0.502	23				
0.243	17	0.518	23				
0.260	19	0.535	23				
0.278	20	0.549	22				
0.293	20						

Project
SR 32 Widening
Project Number
1202.2
Sample Number
A-10-B10, 2c
Material Description
Lean CLAY, very dark brown
Tested By
BWM

ASTM D 2166-06



Wet Density (pcf)	0.0
Dry Density (pcf)	#DIV/0!
% Moisture	#DIV/0!

Unconfined Compressive Strength (tsf)	0.36

Unconfined Compression Test
ASTM D 2166-06

Project Name: SR 32 Widening
Project Number: 1202.2
Sample: A-10-B12, 2c Depth: 6-6.5
Sample Description: Lean CLAY, very dark brown, partially cemented
Date: 4/27/2010
Tested By: BWM

Original Sample Length	5.73
Original Diameter (in)	2.40
Height-to-Diameter Ratio	2.4 : 1
Sample Area (in^2)	4.52

Test Results

Axial Strain at Max. Load	3.7%
Average cross-sectional area (in^2)	4.70
Deflection at Max. Load (in)	0.211
Maximum Load (lbs)	57
Strain at Failure (%)	1.21
Compressive Strength (tsf)	**0.87**

Moisture Density

Tube and Sample (g)	1077.60
Tube (g)	289.20
Sample Weight (g)	788.40
Tare Number	B4
Tare Weight (g)	152.90
Wet Weight (g)	561.10
Dry Weight (g)	471.29
Dry Weight (g)	318.39
Water Weight (g)	89.81
Percent Moisture (%)*	28.2
Wet Density (pcf)	115.9
Dry Density (pcf)	90.4

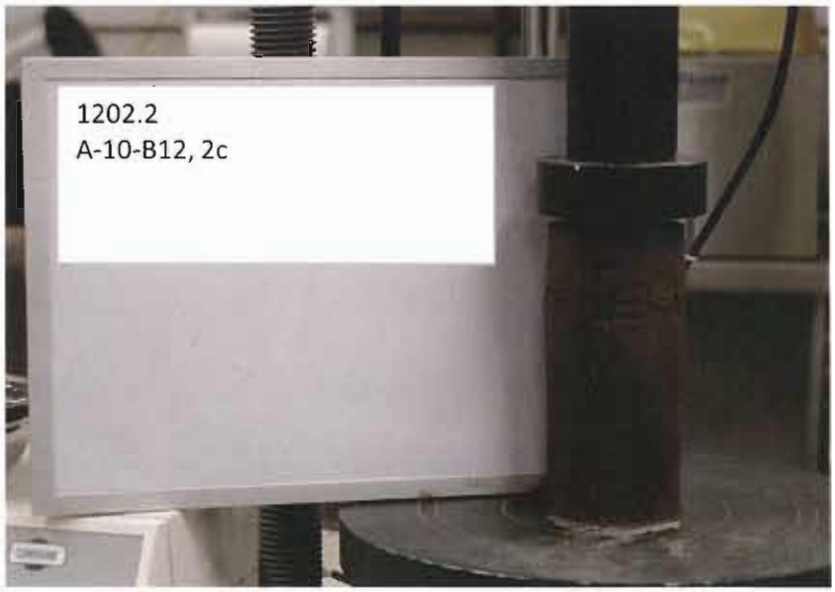
Compression Tests

Dial reading @ 0 lb	0.000

Rate of Strain=0.056in/min

Remarks:

* % moisture taken after test.

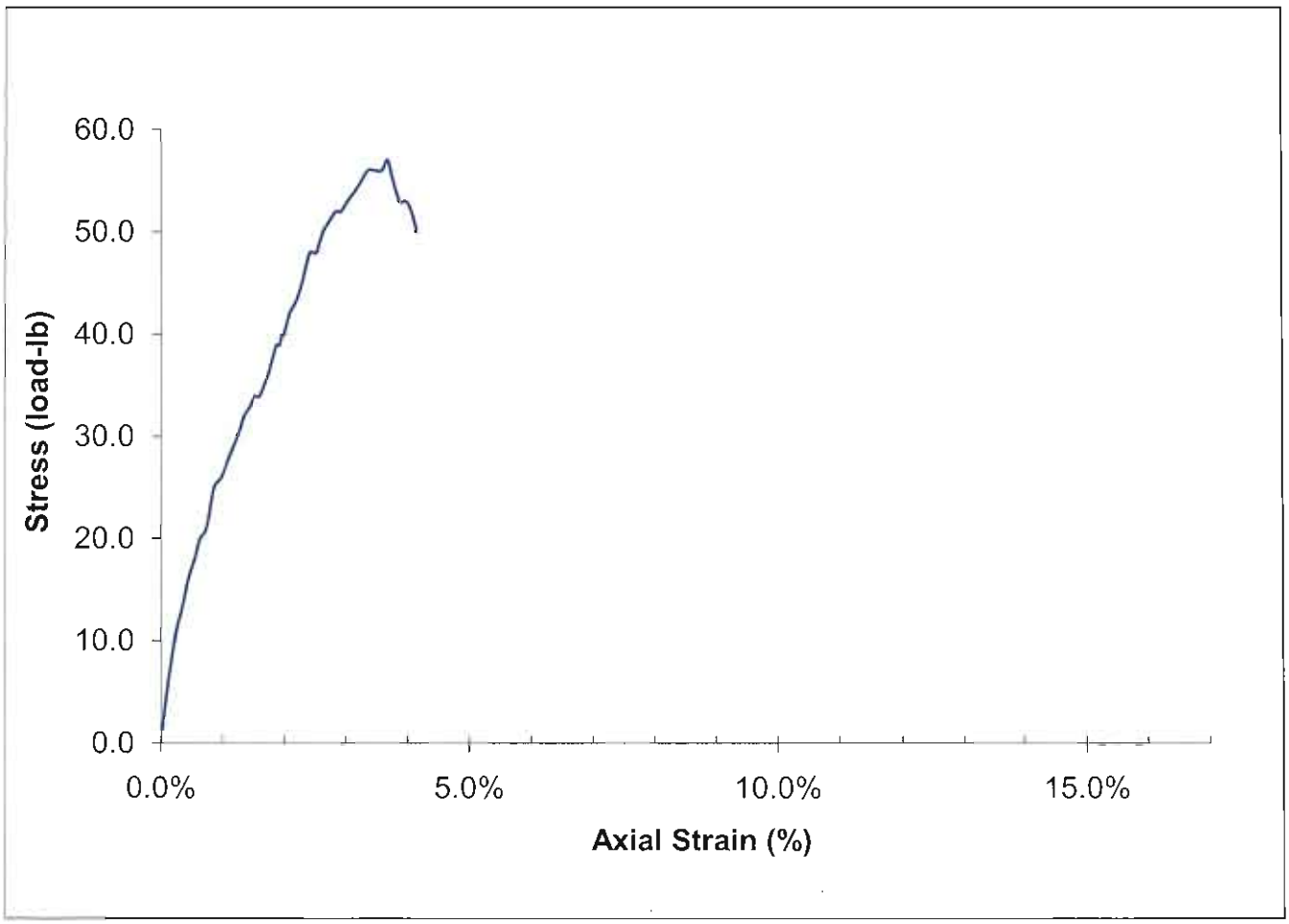


Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.003	3	0.096	35	0.168	52		
0.008	7	0.100	36	0.174	53		
0.014	11	0.105	38	0.181	54		
0.019	13	0.108	39	0.187	55		
0.025	16	0.111	39	0.193	56		
0.031	18	0.113	40	0.199	56		
0.036	20	0.115	40	0.206	56		
0.042	21	0.120	42	0.211	57		
0.049	25	0.125	43	0.216	55		
0.056	26	0.129	44	0.222	53		
0.063	28	0.134	46	0.228	53		
0.071	30	0.139	48	0.233	52		
0.077	32	0.145	48	0.238	50		
0.083	33	0.151	50	0.238	50		
0.087	34	0.157	51				
0.092	34	0.163	52				

Project
SR 32 Widening
Project Number
1202.2
Sample Number
A-10-B12, 2c
Material Description
Lean CLAY, very dark brown, partially cemented
Tested By
BWM

ASTM D 2166-06



Wet Density (pcf)	115.9
Dry Density (pcf)	90.4
% Moisture	28.2

Unconfined Compressive Strength (tsf)	0.87

Unconfined Compression Test
ASTM D 2166-06

blackburn consulting

Project Name: SR 32 Widening
Project Number: 1202.2
Sample: A-10-B19,1c Depth: 6.0-6.5'
Sample Description: Lean CLAY with SAND, very dark brown
Date: 4/12/2010
Tested By: BWM

Original Sample Length	5.97
Original Diameter (in)	2.40
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.52

Test Results

Axial Strain at Max. Load	5.1%
Average cross-sectional area (in^2)	4.77
Deflection at Max. Load (in)	0.307
Maximum Load (lbs)	48
Strain at Failure (%)	1.83
Compressive Strength (tsf)	**0.72**

Moisture Density

Tube and Sample (g)	893.51
Tube (g)	0.00
Sample Weight (g)	893.51
Tare Number	B4
Tare Weight (g)	152.94
Wet Weight (g)	616.98
Dry Weight (g)	547.27
Dry Weight (g)	394.33
Water Weight (g)	69.71
Percent Moisture (%)*	17.7
Wet Density (pcf)	126.0
Dry Density (pcf)	107.1

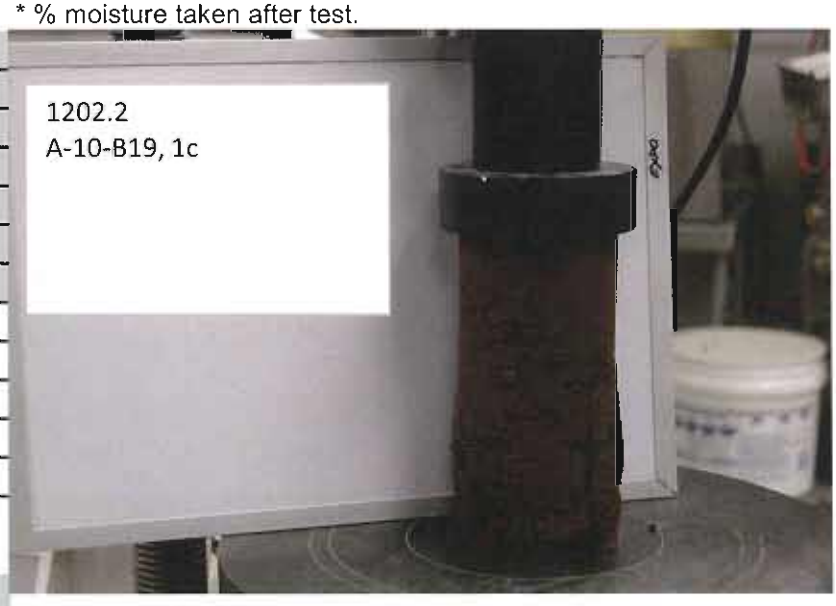
Compression Tests

Dial reading @ 0 lb	0.000

Rate of Strain=0.056in/min

Remarks:

* % moisture taken after test.

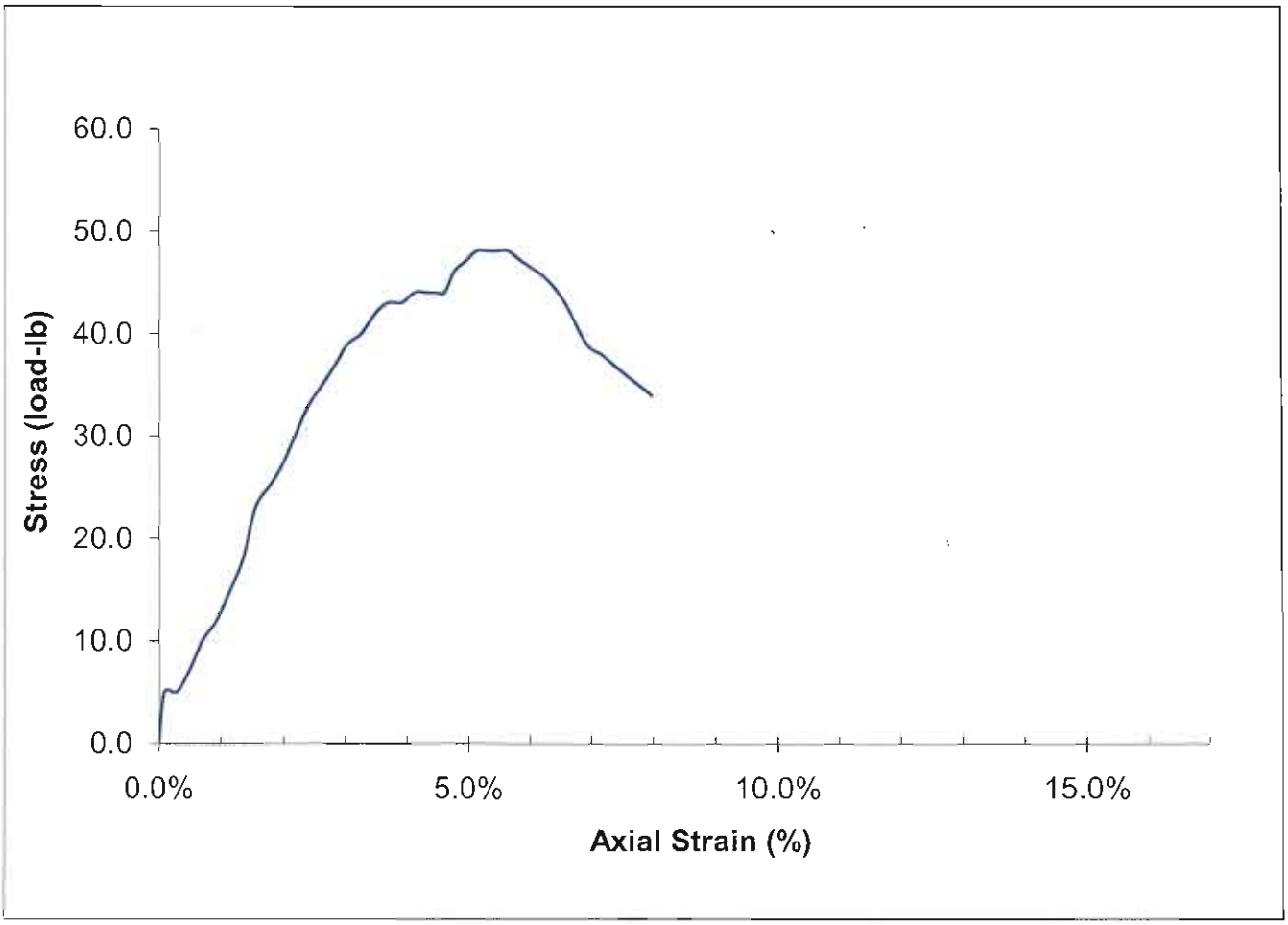


Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.005	5	0.209	42	0.393	43		
0.017	5	0.221	43	0.414	39		
0.029	7	0.234	43	0.428	38		
0.042	10	0.247	44	0.440	37		
0.056	12	0.258	44	0.452	36		
0.069	15	0.267	44	0.477	34		
0.081	18	0.276	44				
0.093	23	0.285	46				
0.106	25	0.296	47				
0.118	27	0.307	48				
0.131	30	0.318	48				
0.144	33	0.327	48				
0.157	35	0.338	48				
0.170	37	0.351	47				
0.182	39	0.366	46				
0.195	40	0.378	45				

Project
SR 32 Widening
Project Number
1202.2
Sample Number
A-10-B19,1c
Material Description
Lean CLAY with SAND, very dark brown
Tested By
BWM

ASTM D 2166-06



Wet Density (pcf)	126.0
Dry Density (pcf)	107.1
% Moisture	17.7

Unconfined Compressive Strength (tsf)	0.72

Unconfined Compression Test
ASTM D 2166-06

Project Name: SR 32 Widening
Project Number: 1202.3
Sample: A-10-B11,1c Depth: 2.0-3.5'
Sample Description: Lean CLAY, very dark brown
Date: 4/12/2010
Tested By: BWM

Original Sample Length	5.97
Original Diameter (in)	2.40
Height-to-Diameter Ratio	2.5 : 1
Sample Area (in^2)	4.52

Test Results

Axial Strain at Max. Load	14.2%
Average cross-sectional area (in^2)	5.27
Deflection at Max. Load (in)	0.846
Maximum Load (lbs)	42
Strain at Failure (%)	5.05
Compressive Strength (tsf)	**0.57**

Moisture Density

Tube and Sample (g)	856.37
Tube (g)	0.00
Sample Weight (g)	856.37
Tare Number	B3
Tare Weight (g)	151.48
Wet Weight (g)	545.30
Dry Weight (g)	464.85
Dry Weight (g)	313.37
Water Weight (g)	80.45
Percent Moisture (%)*	25.7
Wet Density (pcf)	120.8
Dry Density (pcf)	96.1

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

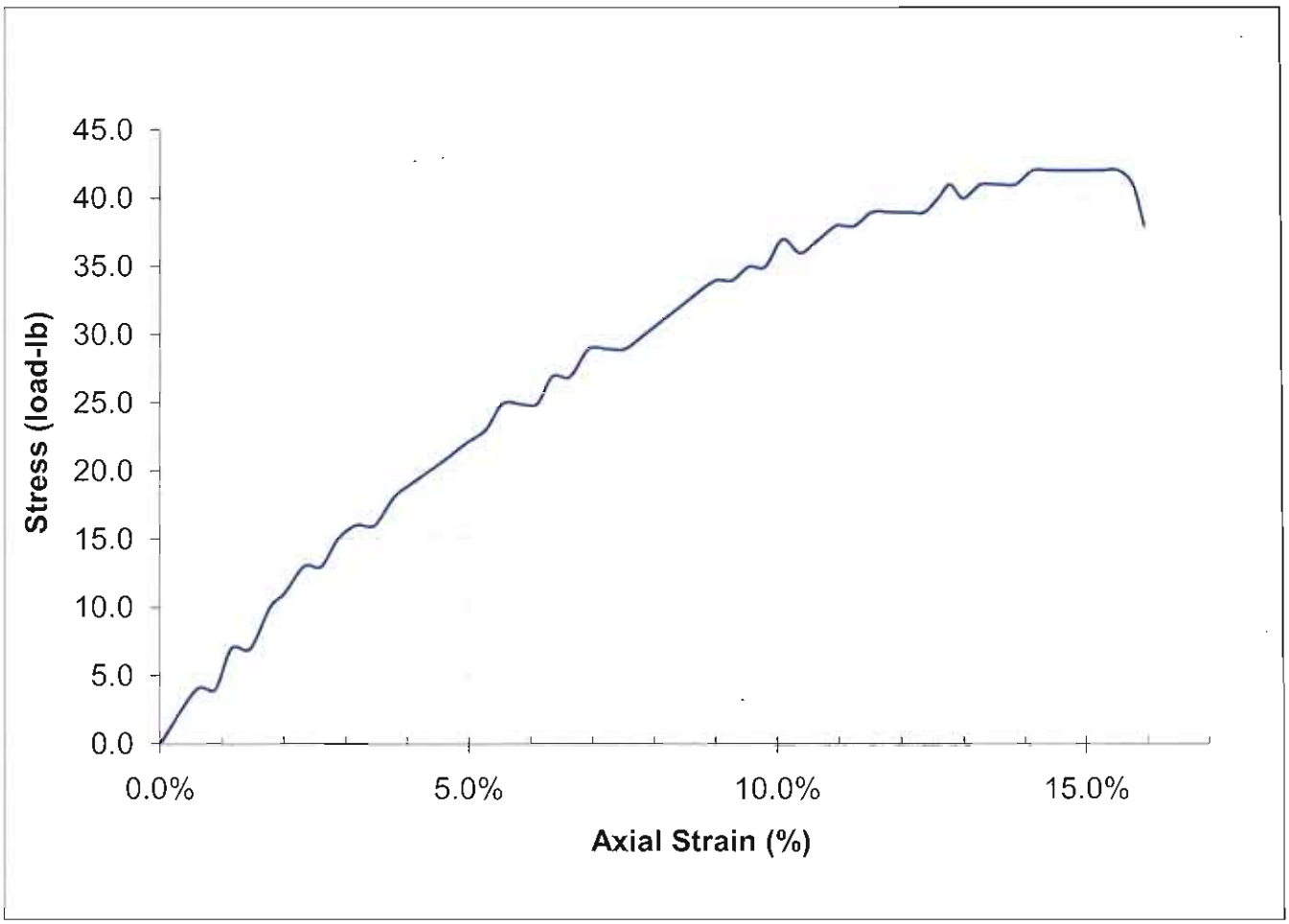
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.035	4	0.316	23	0.587	35	0.846	42
0.053	4	0.333	25	0.604	37	0.862	42
0.069	7	0.350	25	0.621	36	0.880	42
0.087	7	0.366	25	0.639	37	0.897	42
0.106	10	0.381	27	0.656	38	0.914	42
0.120	11	0.398	27	0.674	38	0.930	42
0.139	13	0.416	29	0.691	39	0.944	41
0.156	13	0.434	29	0.709	39	0.955	38
0.172	15	0.451	29	0.727	39		
0.190	16	0.469	30	0.741	39		
0.208	16	0.486	31	0.754	40		
0.226	18	0.503	32	0.765	41		
0.243	19	0.520	33	0.778	40		
0.262	20	0.539	34	0.795	41		
0.280	21	0.555	34	0.811	41		
0.297	22	0.571	35	0.829	41		

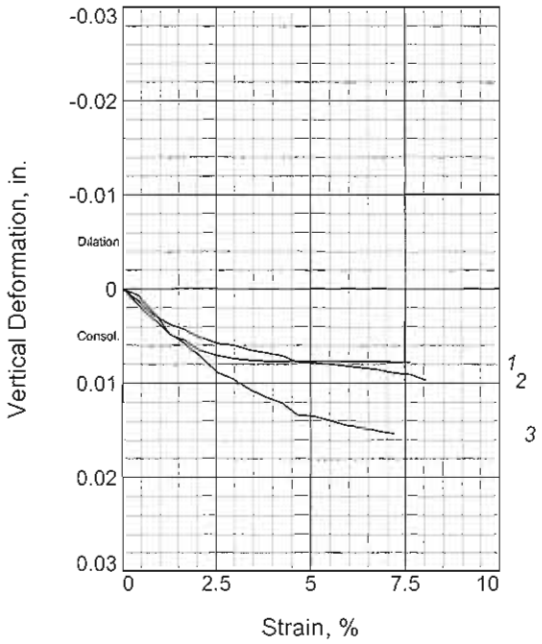
Project
SR 32 Widening
Project Number
1202.3
Sample Number
A-10-B11,1c
Material Description
Lean CLAY, very dark brown
Tested By
BWM

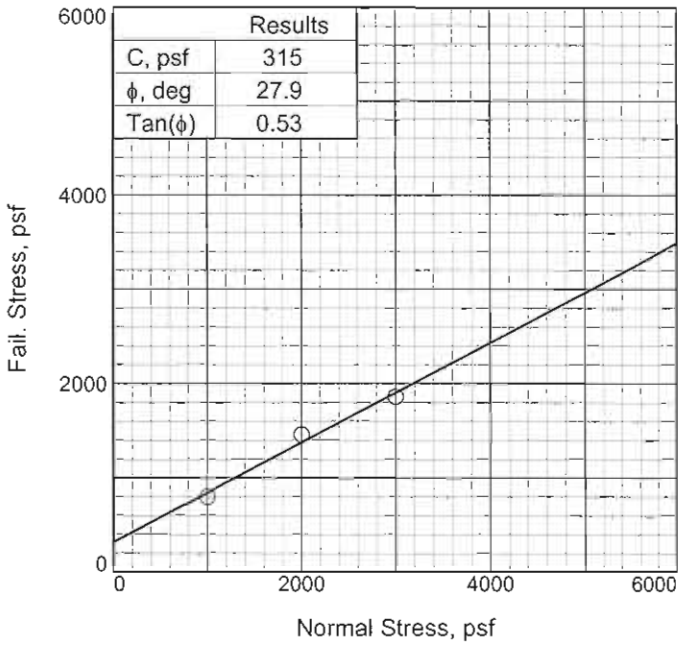
ASTM D 2166-06

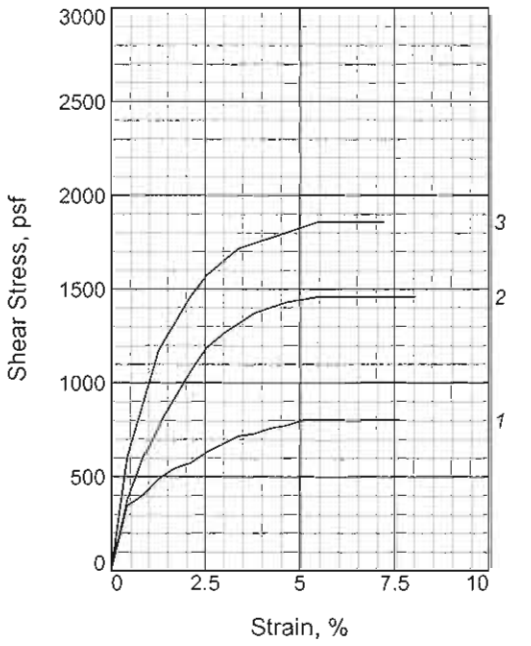


Wet Density (pcf)	120.8
Dry Density (pcf)	96.1
% Moisture	25.7

Unconfined Compressive Strength (tsf)	0.57







Sample No.		1	2	3
Initial	Water Content, %	28.3	29.8	31.5
	Dry Density, pcf	95.1	92.5	87.8
	Saturation, %	98.9	97.9	92.5
	Void Ratio	0.7731	0.8226	0.9201
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.94	0.94
At Test	Water Content, %	27.0	27.9	29.5
	Dry Density, pcf	97.5	96.2	93.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7281	0.7530	0.7957
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.92	0.91	0.88
Normal Stress, psf		1000	2000	3000
Fail. Stress, psf		801	1458	1858
Strain, %		5.1	5.5	5.5
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: Undisturbed
Description: Dark Brown Sandy CLAY

Assumed Specific Gravity= 2.70
Remarks: broken glass in sample

Figure _____

Client: Mark Thomas Company

Project: SR 32 Widening

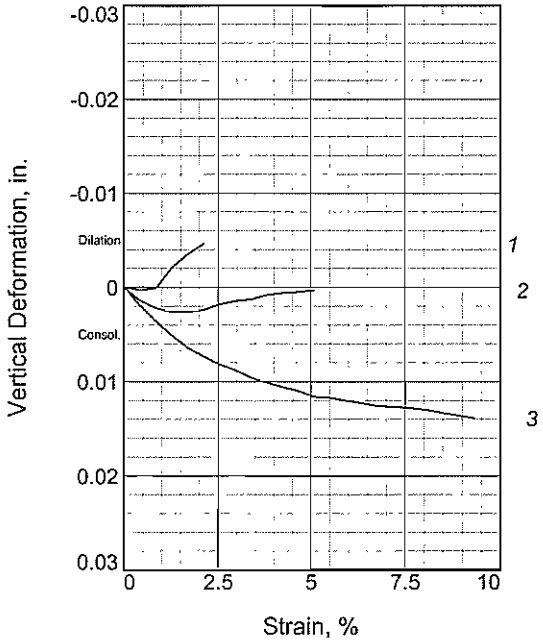
Sample Number: A-10-B17-1C

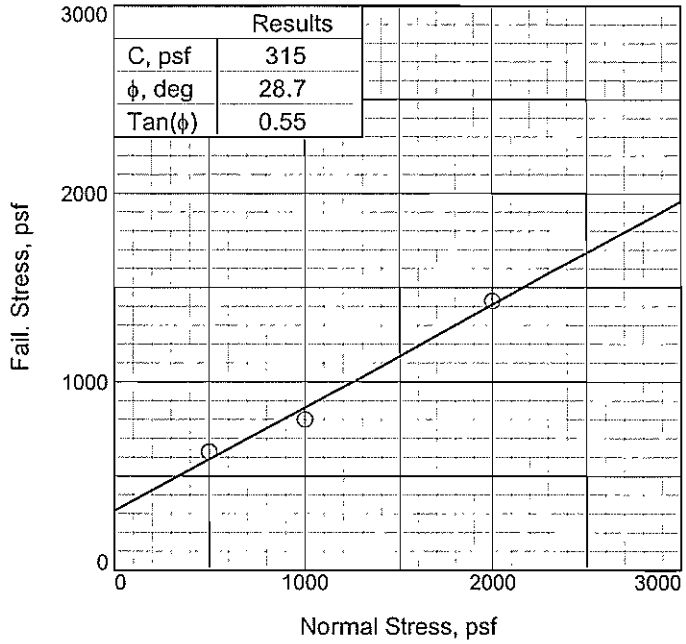
Proj. No.: 1202.1 **Date Sampled:**

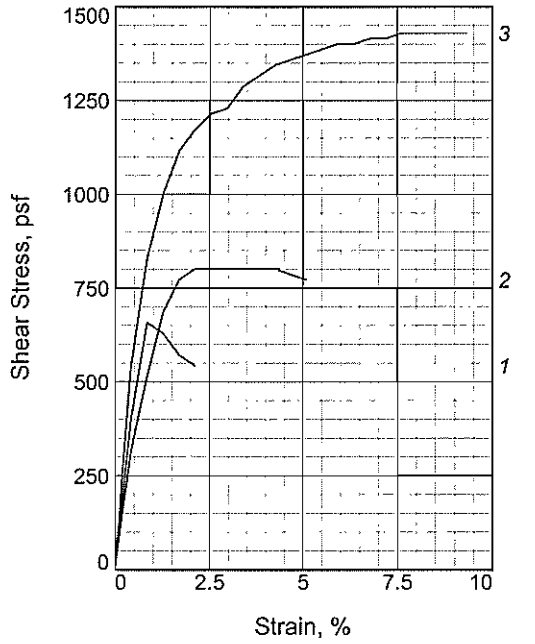
DIRECT SHEAR TEST REPORT

Blackburn Consulting

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







Sample No.		1	2	3
Initial	Water Content, %	14.0	14.1	14.1
	Dry Density, pcf	107.5	108.0	105.7
	Saturation, %	66.6	67.9	63.9
	Void Ratio	0.5673	0.5602	0.5948
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.94	0.94
At Test	Water Content, %	20.8	20.1	19.8
	Dry Density, pcf	107.8	109.3	109.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5630	0.5419	0.5347
	Diameter, in.	2.36	2.36	2.36
	Height, in.	0.94	0.93	0.91
Normal Stress, psf		500	1000	2000
Fail. Stress, psf		629	801	1430
Strain, %		1.3	2.5	7.6
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: Remolded
Description: Brown Sandy CLAY

Assumed Specific Gravity= 2.70
Remarks: Sample remolded to 90% of CTM 216 (90% of 124.8 PCF)=112.3 PCF near 14% moisture

Figure _____

Client: Mark Thomas Company

Project: SR 32 Widening

Sample Number: A-10-B19 Bag E **Depth:** 1.0'-8.0'

Proj. No.: 1202.1 **Date Sampled:**

DIRECT SHEAR TEST REPORT

Blackburn Consulting

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

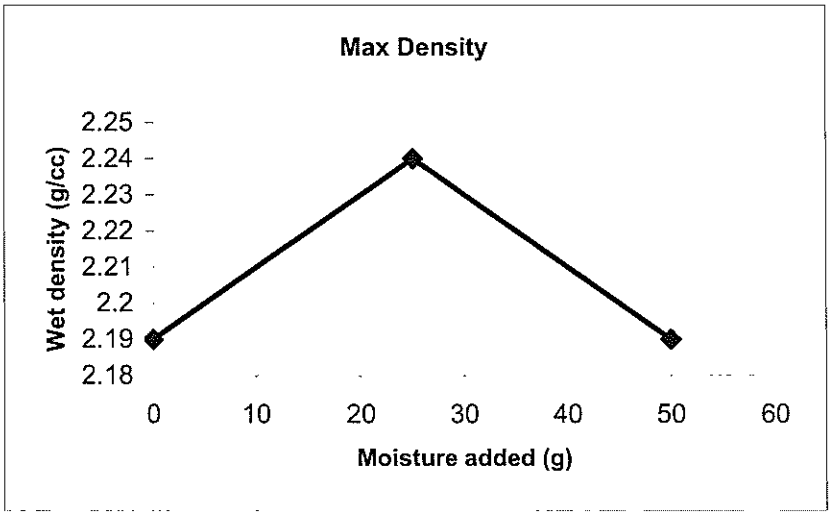
blackburn consulting

Project Name: SR 32 Widening **Date:** 4/13/10
Project No: 1202.1 **Tested by:** B. Moore
Boring/Sample No.: A-10-B8, Bag J **Depth / Location:** 1.0-5.0'
Sample Description: SANDY lean CLAY with GRAVEL, Grayish brown

IMPACT TEST DATA					SAND VOLUME DATA	
Initial Wet Weight of Sample (g)		2500			Initial Sand wt (g)	
Specimen Number	1	2	3	4	Residue wt (g)	
Water Adjustment (g)	0	25	50		Sand used	
Tamper Reading	10.8	10.6	10.8		Cone Correction (g)	
Wet Density (g/cc)	**2.19**	**2.24**	**2.19**		Sand in hole (g)	
					Sand Density (g/cc)	
					Volume of Hole	
					Wet Density (g/cc)	

Rock Correction

Total Sample (g)	16923.8
+3/4" in Air (g)	1103.8
+3/4" in Water (g)	
+3/4" Volume (cc)	
% +3/4"	6.5
% -3/4"	
Density +3/4" (g/cc)	
% +3/4"/ Den. +3/4"	
% -3/4" / Den. -3/4"	
SUM	
Adj. density (g/cc)	**2.24**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY

Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation

Tare #	O	**Max Wet Density (g/cc)**	**2.24**
Tare wt (g)	232.6	**Max Dry Density (g/cc)**	**1.99**
Tare + wet (g)	1960.7	**Max Wet Density (pcf)**	**139.8**
Tare + dry (g)	1769.6	**Max Dry Density (pcf)**	**124.4**
% Moisture	**12.4%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: Moisture @ 0g added = 10.9%
Moisture @ +50g added = 12.9%

CTM 216

blackburn consulting

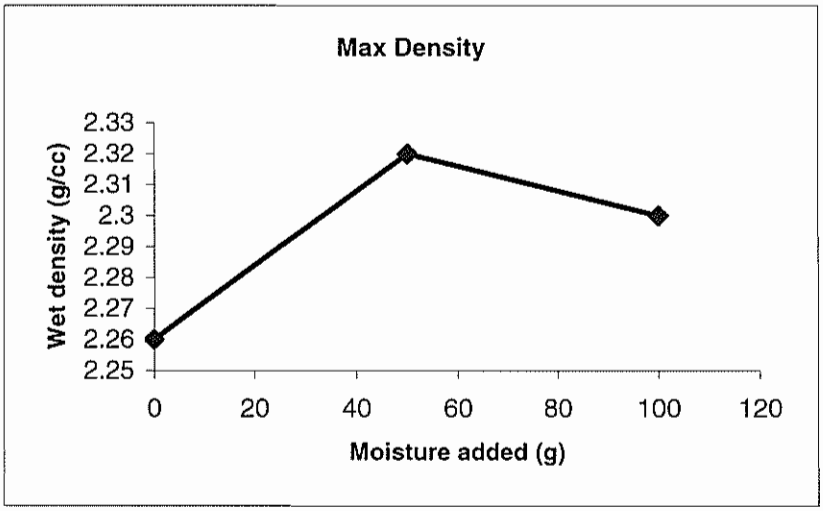
Project Name: SR 32 Widening **Date:** 4/28/10
Project No: 1202.1 **Tested by:** KLC
Boring/Sample No.: A-10-B14 Bag M & N **Depth / Location:** 0-5.0'
Sample Description: Brown Sandy CLAY with Gravel

IMPACT TEST DATA				
Initial Wet Weight of Sample (g)				
Specimen Number	1	2	3	4
Water Adjustment (g)	0	50	100	
Tamper Reading	10.7	10.4	10.5	
Wet Density (g/cc)	**2.26**	**2.32**	**2.3**	

SAND VOLUME DATA	
Initial Sand wt (g)	
Residue wt (g)	
Sand used	
Cone Correction (g)	
Sand in hole (g)	
Sand Density (g/cc)	
Volume of Hole	
Wet Density (g/cc)	

Rock Correction

Total Sample (g)	
+3/4" in Air (g)	
+3/4" in Water (g)	
+3/4" Volume (cc)	
% +3/4"	
% -3/4"	
Density +3/4" (g/cc)	
% +3/4"/ Den. +3/4"	
% -3/4" / Den. -3/4"	
SUM	
Adj. density (g/cc)	**2.32**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY

Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation

Tare #	2	**Max Wet Density (g/cc)**	**2.32**
Tare wt (g)	269.8	**Max Dry Density (g/cc)**	**2.14**
Tare + wet (g)	2816.7	**Max Wet Density (pcf)**	**144.8**
Tare + dry (g)	2622	**Max Dry Density (pcf)**	**133.8**
% Moisture	**8.3%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: No rock correction required

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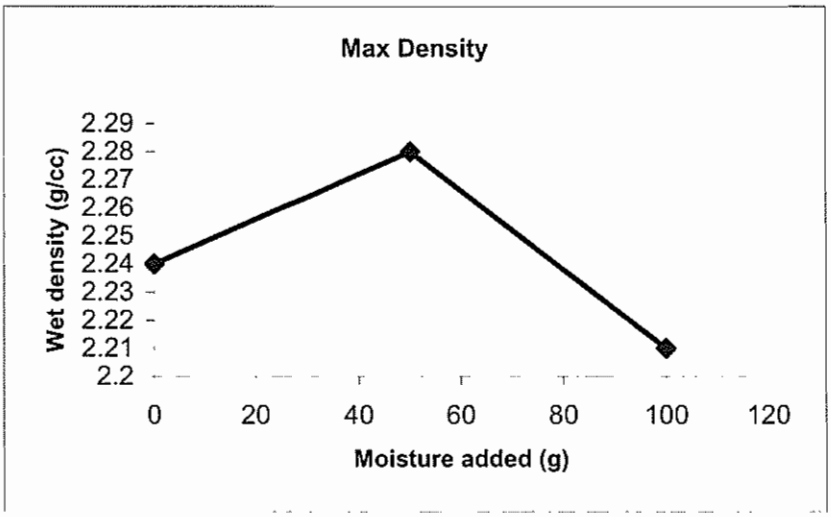
Project Name: SR32 Widening **Date:** 4/14/10
Project No: 1202.1 **Tested by:** J. Carroll
Boring/Sample No.: A-10-B17, Bag H **Depth / Location:** 0.5-5.0'
Sample Description: Lean CLAY with Gravel, dark reddish brown

IMPACT TEST DATA					SAND VOLUME DATA	
Initial Wet Weight of Sample (g)		2500			Initial Sand wt (g)	
Specimen Number	1	2	3	4	Residue wt (g)	
Water Adjustment (g)	0	50	100		Sand used	
Tamper Reading	10.6	10.4	10.7		Cone Correction (g)	
Wet Density (g/cc)	**2.24**	**2.28**	**2.21**		Sand in hole (g)	
					Sand Density (g/cc)	
					Volume of Hole	
					Wet Density (g/cc)	

Rock Correction

Total Sample (g)	17331
+3/4" in Air (g)	1038.9
+3/4" in Water (g)	
+3/4" Volume (cc)	
% +3/4"	6.0
% -3/4"	
Density +3/4" (g/cc)	
% +3/4"/ Den. +3/4"	
% -3/4" / Den. -3/4"	
SUM	
Adj. density (g/cc)	**2.28**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY			
Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation			
Tare #	O	**Max Wet Density (g/cc)**	**2.28**
Tare wt (g)	232.7	**Max Dry Density (g/cc)**	**2.02**
Tare + wet (g)	1693.7	**Max Wet Density (pcf)**	**142.3**
Tare + dry (g)	1528.7	**Max Dry Density (pcf)**	**126.3**
% Moisture	**12.7%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: Moisture @ +0g added = 10.2%
Moisture @ +100g added = 14.1%

CTM 216

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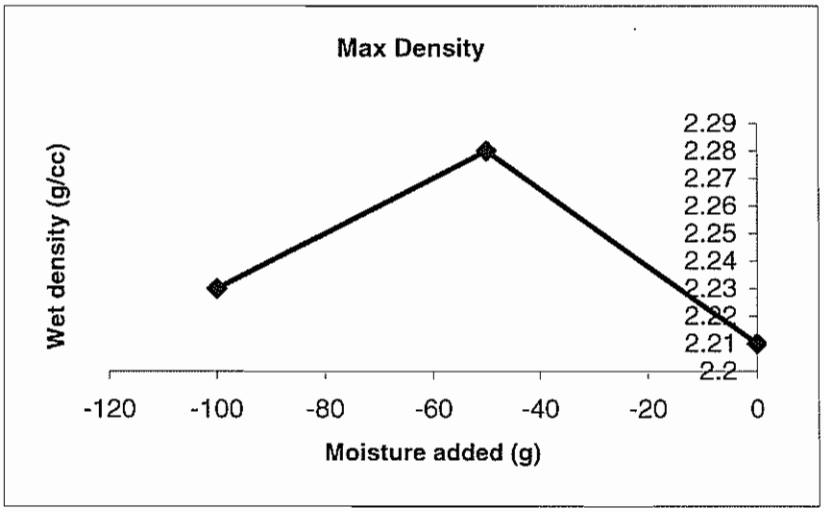
Project Name: SR 32 Widening **Date:** 4/9/10
Project No: 1202.1 **Tested by:** BWM
Boring/Sample No.: A-10-B19 Bag E **Depth / Location:** 1.0'-8.0'
Sample Description: Brown Sandy Lean CLAY

IMPACT TEST DATA				
Initial Wet Weight of Sample (g)		2450		
Specimen Number	1	2	3	4
Water Adjustment (g)	0	-50	-100	
Tamper Reading	10.5	10.2	10.4	
Wet Density (g/cc)	**2.21**	**2.28**	**2.23**	

SAND VOLUME DATA	
Initial Sand wt (g)	
Residue wt (g)	
Sand used	
Cone Correction (g)	
Sand in hole (g)	
Sand Density (g/cc)	
Volume of Hole	
Wet Density (g/cc)	

Rock Correction

Total Sample (g)	
+3/4" in Air (g)	
+3/4" in Water (g)	
+3/4" Volume (cc)	
% +3/4"	
% -3/4"	
Density +3/4" (g/cc)	
% +3/4"/ Den. +3/4"	
% -3/4" / Den. -3/4"	
SUM	
Adj. density (g/cc)	**2.28**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY

Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation

Tare #	T7	**Max Wet Density (g/cc)**	**2.28**
Tare wt (g)	311.3	**Max Dry Density (g/cc)**	**2.00**
Tare + wet (g)	2088.8	**Max Wet Density (pcf)**	**142.3**
Tare + dry (g)	1870.1	**Max Dry Density (pcf)**	**124.8**
% Moisture	**14.0%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: Material screened through #4 sieve prior to running Cal Impact for direct shear

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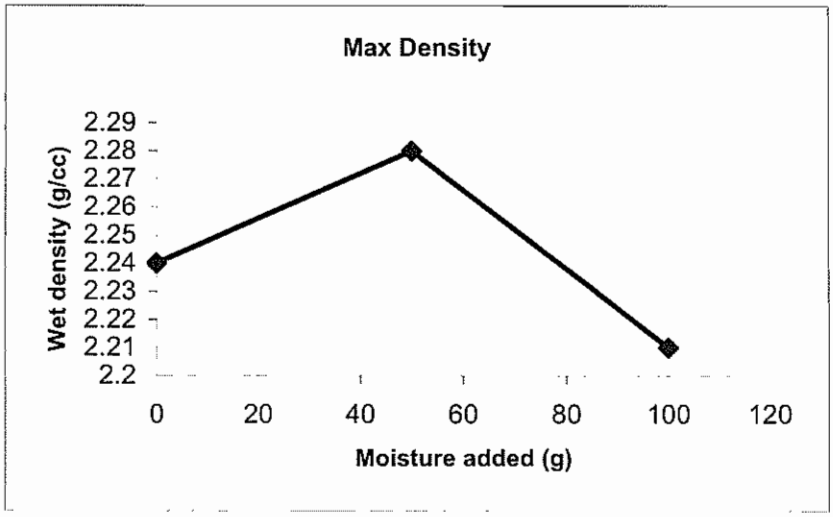
Project Name: SR 32 Widening **Date:** 4/14/10
Project No: 1202.1 **Tested by:** D. Fowler
Boring/Sample No.: A-10-B24, Bag C **Depth / Location:** 1.0-5.0'
Sample Description: SANDY SILT with Gravel, Dark reddish brown

IMPACT TEST DATA					SAND VOLUME DATA	
Initial Wet Weight of Sample (g)		2500			Initial Sand wt (g)	
Specimen Number	1	2	3	4	Residue wt (g)	
Water Adjustment (g)	0	50	100		Sand used	
Tamper Reading	10.6	10.4	10.7		Cone Correction (g)	
Wet Density (g/cc)	**2.24**	**2.28**	**2.21**		Sand in hole (g)	
					Sand Density (g/cc)	
					Volume of Hole	
					Wet Density (g/cc)	

Rock Correction

Total Sample (g)	16679.9
+3/4" in Air (g)	743.2
+3/4" in Water (g)	
+3/4" Volume (cc)	
% +3/4"	4.5
% -3/4"	
Density +3/4" (g/cc)	
% +3/4"/ Den. +3/4"	
% -3/4" / Den. -3/4"	
SUM	
Adj. density (g/cc)	**2.28**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY			
Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation			
Tare #	XX	**Max Wet Density (g/cc)**	**2.28**
Tare wt (g)	233.7	**Max Dry Density (g/cc)**	**2.05**
Tare + wet (g)	1901.1	**Max Wet Density (pcf)**	**142.3**
Tare + dry (g)	1731	**Max Dry Density (pcf)**	**127.8**
% Moisture	**11.4%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: Moisture @ +0g = 8.4%
Moisute @ +100g = 13.4%

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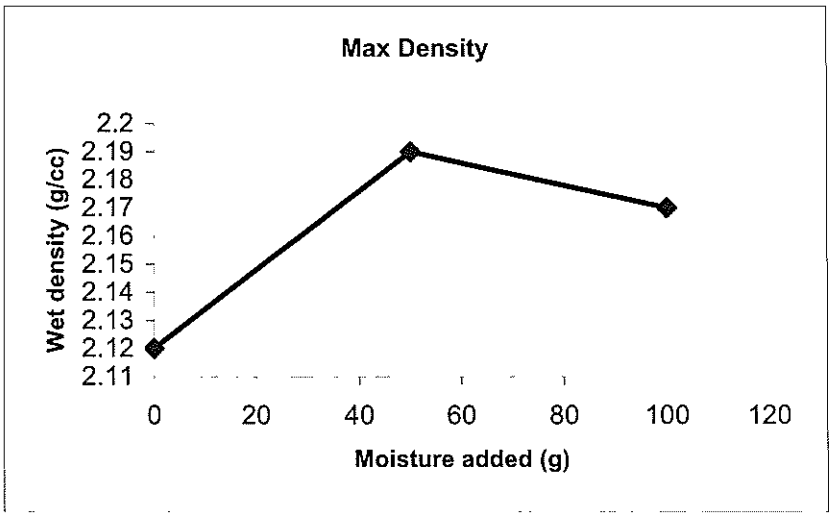
Project Name: SR 32 Widening **Date:** 4/15/10
Project No: 1202.1 **Tested by:** B. Moore
Boring/Sample No.: A-10-B27, Bag A **Depth / Location:** 0.5-5.0'
Sample Description: SANDY SILTY CLAY with trace Gravel, Dark reddish brown

IMPACT TEST DATA					SAND VOLUME DATA	
Initial Wet Weight of Sample (g)		2500			Initial Sand wt (g)	
Specimen Number	1	2	3	4	Residue wt (g)	
Water Adjustment (g)	0	50	100		Sand used	
Tamper Reading	11.2	10.8	10.9		Cone Correction (g)	
Wet Density (g/cc)	**2.12**	**2.19**	**2.17**		Sand in hole (g)	
					Sand Density (g/cc)	
					Volume of Hole	
					Wet Density (g/cc)	

Rock Correction

Total Sample (g)	21545.7
+3/4" in Air (g)	3645.7
+3/4" in Water (g)	2200
+3/4" Volume (cc)	1445.7
% +3/4"	16.9
% -3/4"	83.1
Density +3/4" (g/cc)	2.52
% +3/4"/ Den. +3/4"	6.71
% -3/4" / Den. -3/4"	37.94
SUM	44.65
Adj. density (g/cc)	**2.24**



MOISTURE ADJUSTMENT FOR AGGREGATE BASE PAY QUANTITY

Inplace Wet		Test Spec Wet	
Inplace dry		Test Spec Dry	
Inplace Water		Test Spec Water	
Inplace % Water		Test Spec % Water	

Dry Density Calculation			
Tare #	Q	**Max Wet Density (g/cc)**	**2.24**
Tare wt (g)	240.9	**Max Dry Density (g/cc)**	**2.00**
Tare + wet (g)	2069.1	**Max Wet Density (pcf)**	**139.8**
Tare + dry (g)	1869.5	**Max Dry Density (pcf)**	**124.6**
% Moisture	**12.3%**		

%+3/4 Adjustment	
20	1.00
21-25	0.99
26-30	0.98
31-35	0.97
36-40	0.96
41-45	0.95
46-50	0.94

Remarks: Moisture @ +0g = 9.5%
Moisture @ +100g = 14.2%

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 04/14/2010
Date Submitted 04/09/2010

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 1202.1/SR 32 WIDENIG Site ID : MW1 BAG J.
Your purchase order number is 1202.1. A-10-84
Thank you for your business.

* For future reference to this analysis please use SUN # 57685-117004.

EVALUATION FOR SOIL CORROSION

Soil pH	6.98		
Minimum Resistivity	3.75 ohm-cm (x1000)		
Chloride	5.9 ppm	00.00059	%
Sulfate	18.4 ppm	00.00184	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 04/23/2010
Date Submitted 04/20/2010

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 1202.1/SR 32 WDENING Site ID : [redacted] BAG M.
Your purchase order number is 1202.1. A-10-814
Thank you for your business.

* For future reference to this analysis please use SUN # 57764-117182.

EVALUATION FOR SOIL CORROSION

Soil pH	6.13		
Minimum Resistivity	8.31 ohm-cm (x1000)		
Chloride	10.7 ppm	00.00107	%
Sulfate	0.4 ppm	00.00004	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 04/14/2010
Date Submitted 04/09/2010

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 1202.1/SR 32 WIDENIG Site ID : ~~SDRM4~~ BAG E.
A-10-B19
Your purchase order number is 1202.1.
Thank you for your business.

* For future reference to this analysis please use SUN # 57685-117003.

EVALUATION FOR SOIL CORROSION

Soil pH	6.50	
Minimum Resistivity	5.36 ohm-cm (x1000)	
Chloride	7.5 ppm	00.00075 %
Sulfate	9.1 ppm	00.00091 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 04/14/2010
Date Submitted 04/09/2010

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 1202.1/SR 32 WIDENIG Site ID : MW3 BAG C.
Your purchase order number is 1202.1. A-10-B24
Thank you for your business.

* For future reference to this analysis please use SUN # 57685-117002.

EVALUATION FOR SOIL CORROSION

Soil pH	6.78	
Minimum Resistivity	4.29 ohm-cm (x1000)	
Chloride	6.7 ppm	00.00067 %
Sulfate	4.9 ppm	00.00049 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422