FOR CONTRACT NO.: 09-352704

INFORMATION HANDOUT

MATERIALS INFORMATION

GEOTECHNICAL DESIGN REPORT

ROUTE: 09-Mno-203-7.1

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: **TERRY ERLWEIN**
Traffic Operations Engineer
District 9

Attention: Michell Ngo

Date: January 18, 2012

File: 09-Mno-395
PM 25.2, 25.84
09-352700
Project ID. 09 0002 0113
Mammoth CMS

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Geotechnical Design Report

Introduction

Per your email request, dated on October 28, 2011, a Geotechnical Design Report (GDR) is provided for the Change Message Sign project on SR 203 near the intersection with Highway 395 in Mono County.

This project proposes to construct a Model 500 Change Message Sign to the south of eastbound SR203, east of Meridian Boulevard (Plate 1, Vicinity Map).

This memorandum documents the geotechnical recommendations regarding the foundation of the CMS sign.

Pertinent Reports and Investigations

In preparing of this report, following documents were reviewed:

1. Western Regional Climate Center for 1989-2007.
2. Bailey, R.A., 1989, Geologic map of Long Valley caldera, Mono-Inyo Craters volcanic chain and vicinity, eastern California: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1933, scale 1:62500.
3. As-built Log of Test Boring (LOTB): Route 395/203 Separation (Br. #45-0071), dated June 26, 1967.
4. Log of Exploratory Boring, Groundwater Monitoring Well Installation Report, Chevron Products Company Service Station #9-1861, 3236 Main Street, Mammoth Lakes, CA, dated September 11, 2007.

5. Groundwater Level Data Wells 04S28E06L002M, 03S28E32E007M, 03S27E25M001M, from Department of Water Resources.
6. Department of Transportation, Project Plans for Construction on State Highway in Mono County in and near Mammoth Lakes from Lake Mary Road to Route 395, Contract No. 09-284604, dated December 10, 2001.
7. Department of Transportation, Project Plans for Construction on State Highway in Mono County in Mammoth Lakes at Meridian Boulevard, Contract No. 09-245804, dated March 8, 1993.

Existing Facilities and Proposed Improvements

Route 203 extends roughly east west from Highway 395, south of Crowley Lake, to Mammoth Mountain, Figure 1. The roadway through this portion consists of a four lane divided highway. The eastbound portion appeared to have been constructed at original grade and the westbound section upon fill. According to as-builts (Contract No.09-245804) there is an edge-drain system situated in the gore area of the right turn from Meridian Boulevard to SR 203. The edge drainage does not appear to extend through the project area. Underground electric lines run parallel to the roadway on the north and south sides of EB SR203. An overhead lighting system trends along the south side of SR203.

This project proposes to construct a Model 500 Changeable Message Sign on eastbound SR 203, at about PM 7.04, east of Meridian Boulevard, and approximately 20-feet right of the eastbound SR203 travelled way (Plate 3, Location Plan).

Physical Setting

The physical setting of the project site and the surrounding area was reviewed to provide climate, topography and drainage, man-made and natural features, geology characteristics to aid in project design and construction planning. The following is a discussion of the review:

Climate

Information regarding the climate in the project area is provided by the Western Regional Climate Center period of record from 1993 to 2011. There is one station located near the project site (Mammoth Lakes Ranger Station #045280). The average annual total precipitation is 23.49 in. The majority of this precipitation falls between November and March. The average daily

minimum temperature ranges from 15.9° F in January to 46.4° F in July, and the average daily maximum temperature ranges from 39.1° F in February to 78.2° F in July. Freezing temperatures and snowfall are common at the project site, as the average yearly snowfall is 212.3 inches. Yearly updates are available at the Western Regional Climate Center web site.

Topography & Drainage

The topographic map of the Old Mammoth quadrangle (USGS, 1994) was reviewed. The map indicates that the site is situated at an elevation of about 2330-feet above mean sea level. The surrounding topography consists of relatively flat-lying lands, and low, rolling hills. The surrounding topography becomes steeper towards Mammoth Mountain the Sierra Nevada Mountain Range, to the west of the subject location. Overall drainage is to the east.

Man-made and Natural Features of Engineering and Construction Significance

There are underground utility lines that run parallel to EB SR203 on either side. There is no railroad crosses the roadway near the two CMS locations. No river intersects the proposed project areas.

Regional Geology

According to the Geologic map of Long Valley caldera, Mono-Inyo Craters volcanic chain and vicinity, eastern California (USGS, 1989) the site is underlain by Quaternary porphyritic basalt (Qpb). A section from this map showing the project location is attached as Plate No. 2.

Exploration

Due to the time constraints, in that the request for investigation was submitted October 28, 2011 and PS&E is January 1, 2012 and RTL is March 5, 2012, a detailed subsurface investigation was not performed. Since the SR203/395 Interchange OC (Bridge No. 47-50 is near the proposed CMS, the as-built LOTB for this bridge is sufficient to provide data needed for the analyses. In addition, boring logs were reviewed for hazardous waste site near the project location.

In general, the soil characteristics within the project area, according to exiting as-built LOTB and surrounding boring logs consist of fine to coarse grained, loose to very dense GRAVELLY SAND WITH COBBLES and SANDY GRAVEL to depths varying from 5-feet to thirty-feet

below ground surface. Below the SANDY GRAVEL is basalt bedrock that is very dense.

Geotechnical Testing

Corrosion

Due to the nature of the upper level soils and seasonal shallow groundwater, the site can be considered corrosive to steel elements.

Geotechnical Conditions

In general, the soil characteristics within the project area, according to exiting as-built LOTB and surrounding boring logs consist of fine to coarse grained, very dense GRAVELLY SAND WITH COBBLES and SANDY GRAVEL to depths varying from 5-feet to thirty-feet below ground surface. Below the SANDY GRAVEL is basalt bedrock that is very dense.

Groundwater

The State Department of Water Resources (DWR) has monitored groundwater level wells across California for decades. Three monitoring wells within the vicinity of the project areas were reviewed (data recorded range from 1989-2007). The data varied from 8.6-feet below ground surface in Well 03S28E32E007M to 400-feet below ground surface in Well 03S27E25M001M. Groundwater conditions will vary according to variations in rainfall, well pumping, and construction activities.

According to as-built LOTB, drilled in June 1967, no groundwater was encountered to the maximum depth of about 40 ft.

Other sources of groundwater level data come from Geotracker (www.geotracker.com) which is a database of hazardous waste sites in California, maintained by the California State Water Resources Control Board (SWRCB). Surrounding Leaking Underground Storage Tank (LUST) sites that have been explored and monitored for petroleum hydrocarbons in the soil and groundwater have indicated seasonal groundwater fluctuations between 5 to fifteen feet below ground surface in the spring and early summer.

Geotechnical Recommendations

The soil conditions at the CMS location is expected to satisfy the 2006 standard model requirements. The Office of Geotechnical Design North recommends that the proposed standard plan (2006) pile foundation for a Model 500 Changeable Message Sign can be constructed as planned. This model should consist of a single cast-in-drilled-hole (CIDH) pile of 22-ft in embedment length and 5 ft in diameter. If bedrock is encountered, the CIDH pile foundation may be socketed 10-feet into the rock or to a total embedment depth of 22-feet below ground surface.

Construction Considerations

1. All earthworks shall follow Section 19 of Caltrans Standard Specifications.
2. Loose sand may be encountered during pile construction. Temporary casing may be needed for CIDH piles construction if caving occurs. If temporary casing is used during installation of CIDH piles, it shall be removed while the concrete is being placed in order to develop the required pile capacity.
3. Difficult drilling conditions are expected in the glacial till and in the basalt bedrock. The upper glacial till consists of silty sand with abundant cobbles and boulders to three-feet in diameter.
4. Depending on when construction commences, groundwater may be perched upon the lower basalt bedrock, if water is encountered during pile construction, the pile will have to be constructed using the wet method.

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

None

Data and information included in the Information Handout provided to the bidders and contractors are:

Geotechnical Design Report for EA 09-352701, dated January 18, 2011.

Data and information available for inspection at the District Office:

None.

Data and information available for inspection at the Transportation Laboratory are:

None.

If you have any questions or comments, please call me, Brandon Badeker, at (916) 227-1046 or my supervisor, John Huang, at (916) 227-1037.

BRANDON BADEKER, C.E.G.
Engineering Geologist
Office of Geotechnical Design – North
Branch E

c: John Huang (Geotechnical Services, Geotechnical Design North)
Brian McElwain (D09 Project Manager)
Mark Willian (Geotechnical Services, Corporate Unit)

Dave Dhillon (D09 District Materials Engineer)
District Construction R.E. Pending File
Brad Rockwell (D09 Office Engineer)

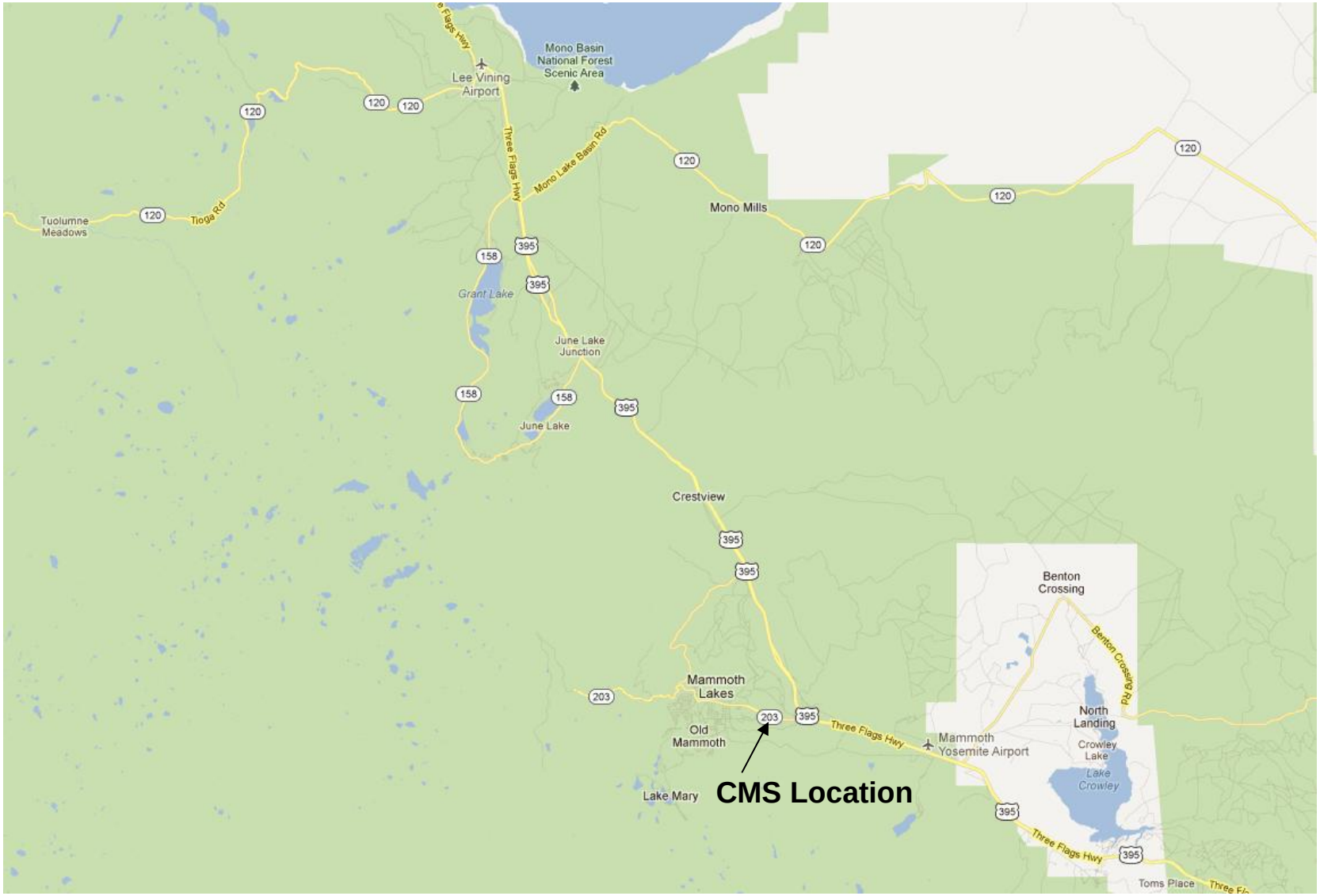
LIST OF ATTACHMENTS

Plate 1 Vicinity Map

Plate 2 Geologic Map

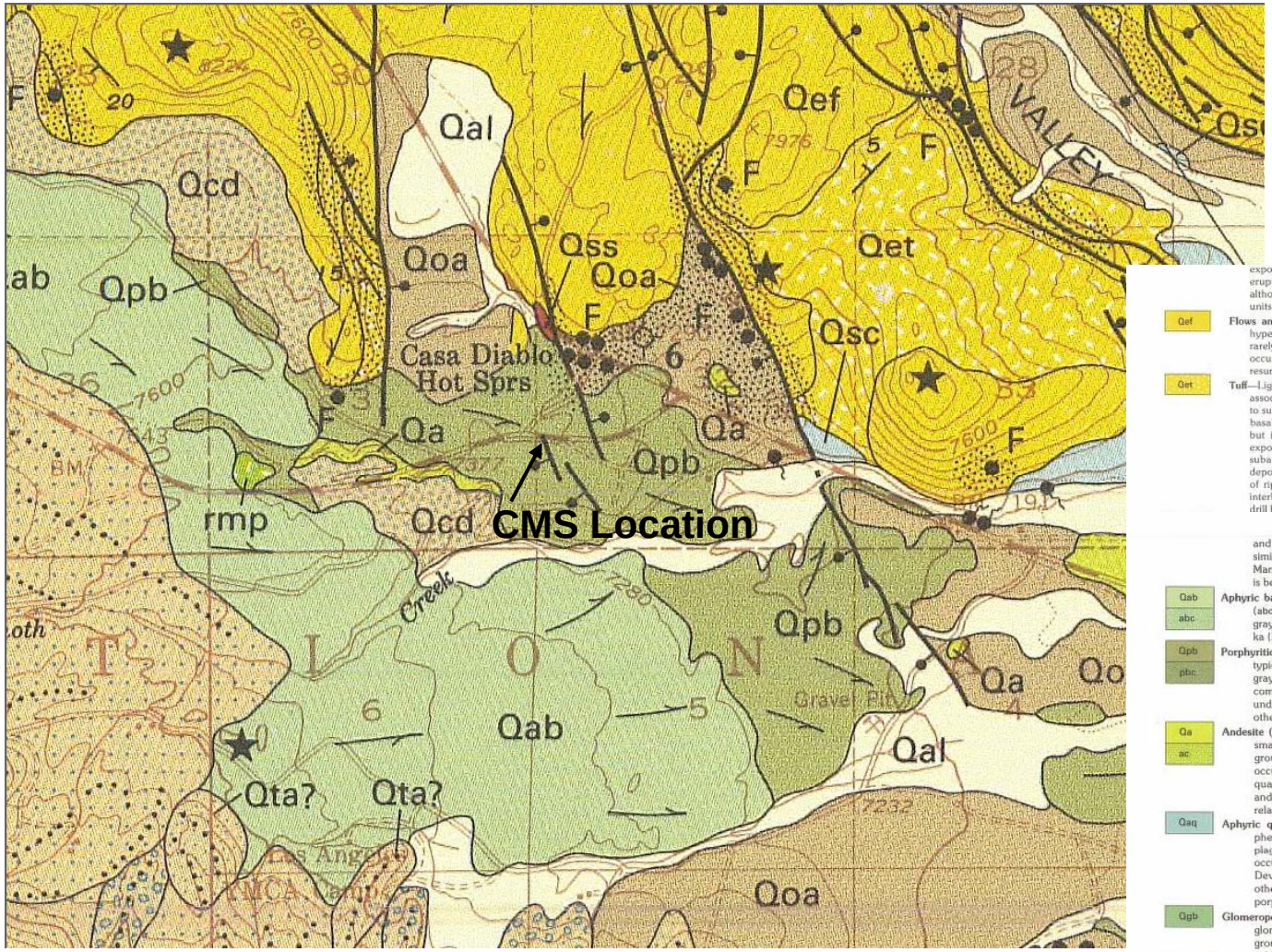
Plate 3 Location Plan

As-Built LOTB for Route 395/203 Separation



Map adapted from Google Maps, 2012.

CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 09-352700 Date: January 2012	**VICINITY MAP**	Plate 1
	09-MNO-395 PM 25.2/25.84 **MAMMOTH CMS**		



exposed mainly on resurgent dome in central part of Long Valley caldera; postdates eruption of Bishop Tuff and represents earliest episode of postcaldera volcanism; although K-Ar ages range from 751 to 652 ka (Mankinen and others, 1986), all flow units overlie 727–ka intracaldera Bishop Tuff. Divided into:

Qef — **Flows and domes**—Aphyric to sparsely porphyritic rhyolite containing small plagioclase, hypersthene, and rarely biotite phenocrysts; texture and color variable from black or rarely red-brown obsidian to gray perlite, brown felsite, and brownish-gray pumice; occurs as relatively thin (25–50 m) extensive (2–6 km) flows and dome flows on resurgent dome

Qet — **Tuff**—Light-gray to white, massive to bedded rhyolite tuff mineralogically similar to associated aphyric to sparsely porphyritic flows (unit Qef); commonly contains angular to subrounded accidental inclusions of densely welded Bishop Tuff and, less commonly basaltic, granitic, and metamorphic rock fragments; exposed mainly on resurgent dome but is encountered in drill holes in subsurface throughout caldera moat; although exposure is limited, tuff on resurgent dome appears to have been deposited mainly subaerially, but tuff on flanks of dome and in moat may be mainly subaqueous, deposited in waters of Pleistocene Long Valley Lake, as suggested by local occurrence of ripple marks and soft-sediment deformation; tuffs mainly underlie but locally are interbedded with early rhyolite flows (unit Qef); maximum thickness encountered in drill holes is about 600 m but probably is greater locally

and 212 ka, respectively (Mankinen and others, 1986); also includes a mineralogically similar rhyolite pumice-fall deposit (rmp) locally abundant on northeast flank of Mammoth Mountain and at scattered localities within caldera; its probable source vent is beneath rhyolite dome at base of Lincoln Peak

Qab / abc — **Aphyric basalt (Pleistocene)**—Aphyric to sparsely porphyritic trachybasaltic lava and cinder (abc) containing small olivine and plagioclase phenocrysts in reddish-brown to dark-gray aphanitic or medium-gray crystalline groundmass; K-Ar ages range from 152 to 64 ka (Mankinen and others, 1986)

Qpb / pbc — **Porphyritic basalt (Pleistocene)**—Coarsely porphyritic trachybasaltic lava and cinder (pbc) typically containing plagioclase, olivine, and augite, phenocrysts in a medium to dark-gray aphanitic groundmass; some flows contain abundant plagioclase phenocrysts commonly 1 cm long; flow in north moat has K-Ar age of 108 ka; flow in south moat undated but limited between 126 and 64 ka by age of adjacent flows (Mankinen and others, 1986)

Qa / ac — **Andesite (Pleistocene)**—Sparsely porphyritic trachyandesitic lava and cinder (ac) containing small plagioclase and olivine phenocrysts in reddish-brown to medium-gray or black groundmass; flows commonly exhibit subhorizontal platy jointing in exposed interiors; occurs near Mammoth Pass and in west moat of Long Valley caldera, Devils Postpile quadrangle, where K-Ar ages range from 228 to 83 ka (Mankinen and others, 1986) and also near June Lake, in Mono Craters quadrangle, where large cinder cone and related flows postdate Tahoe glaciation and predate Tioga glaciation (Putnam, 1949)

Qaq — **Aphyric quartz latite (Pleistocene)**—Aphyric to sparsely porphyritic lava containing small phenocrysts of either augite, hypersthene, and plagioclase or hornblende and plagioclase in medium-gray to pinkish-brown aphanitic or black glassy groundmass; occurs as domes and flows underlying or interbedded with postcaldera basaltic lavas in Devils Postpile quadrangle; flow in west moat has K-Ar age of 103 ka (Mankinen and others, 1986) but domes near Pumice Butte and flow near Devils Postpile predate porphyritic quartz latites of Mammoth Mountain and are older

Qgb — **Glomeroporphyritic basalt (Pleistocene)**—Trachybasaltic lava flows typically containing sparse glomeroporphyritic clots of olivine, augite, and plagioclase in a relatively coarse-grained groundmass; occurs locally along western margin of resurgent dome in Long Valley caldera; K-Ar ages range from 155 to 145 ka (Mankinen and others, 1986)

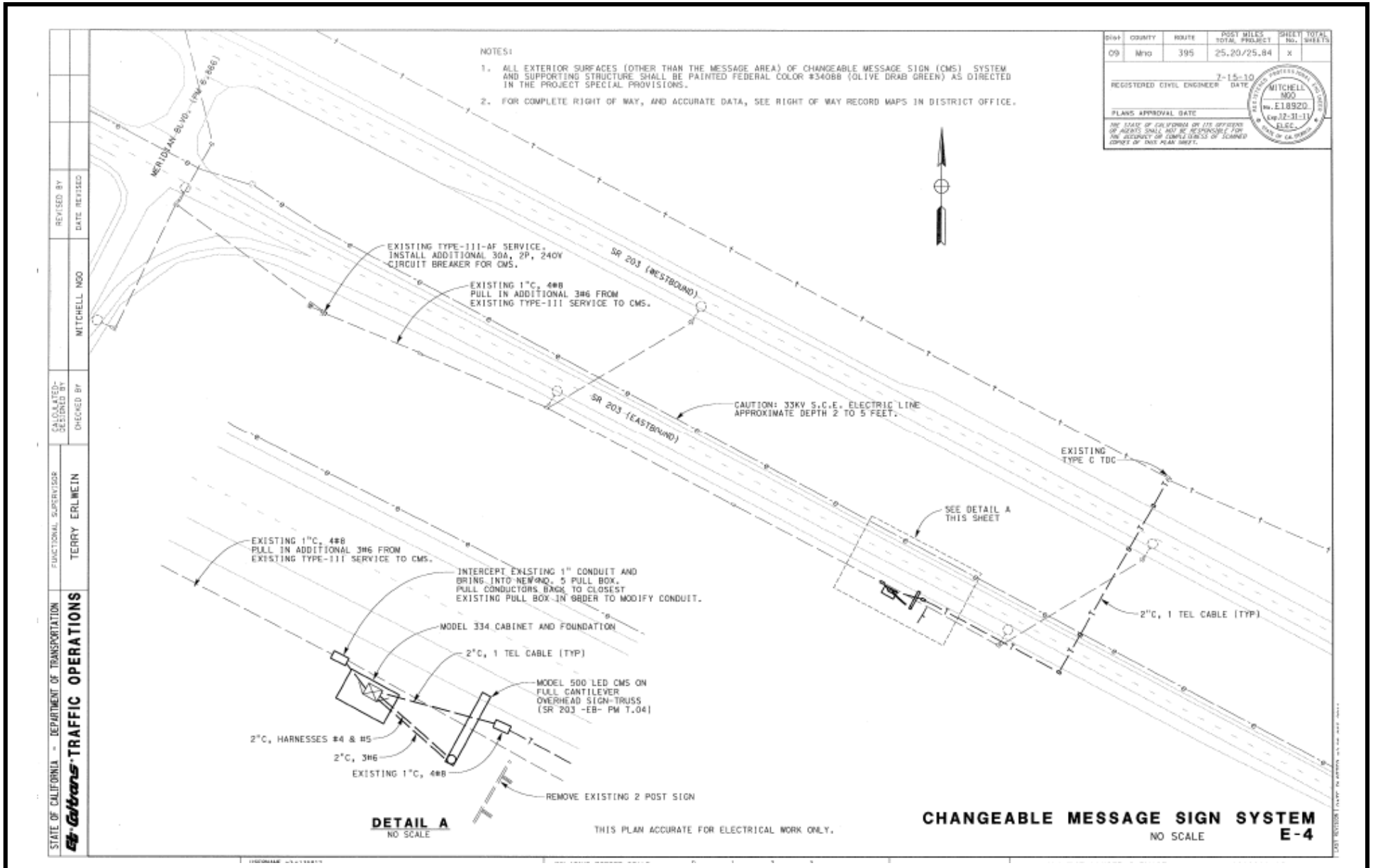
Qhrd — **Hornblende rhyodacite (Pleistocene)**—Single, isolated rhyodacite dome on northeast edge of Long Valley caldera; contains small hornblende and plagioclase phenocrysts in gray glassy matrix; age is uncertain, but probably was extruded in early postcaldera time, possibly subaqueously in caldera lake

Qob — **Older basalt (Pleistocene)**—Porphyritic olivine-augite basaltic lava commonly showing nontronitic alteration; forms The Buttresses in gorge of Middle Fork of San Joaquin River, Devils Postpile quadrangle; age uncertain but probably early Quaternary on basis of topographic relations

Quartz latite of San Joaquin Ridge (Pliocene)—Coarsely porphyritic quartz latite forming

Map adapted from Bailey, R.A., 1989, Geologic map of Long Valley caldera, Mono-Inyo Craters volcanic chain and vicinity, eastern California: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1933, scale 1:62500.

CALTRANS Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 09-352700 Date: January 2012	**GEOLOGIC MAP**	Plate 2
		09-MNO-395 PM 25.2/25.84 **MAMMOTH CMS**	



CALTRANS
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

EA: 09-352700

Date: January 2012

LOCATION MAP

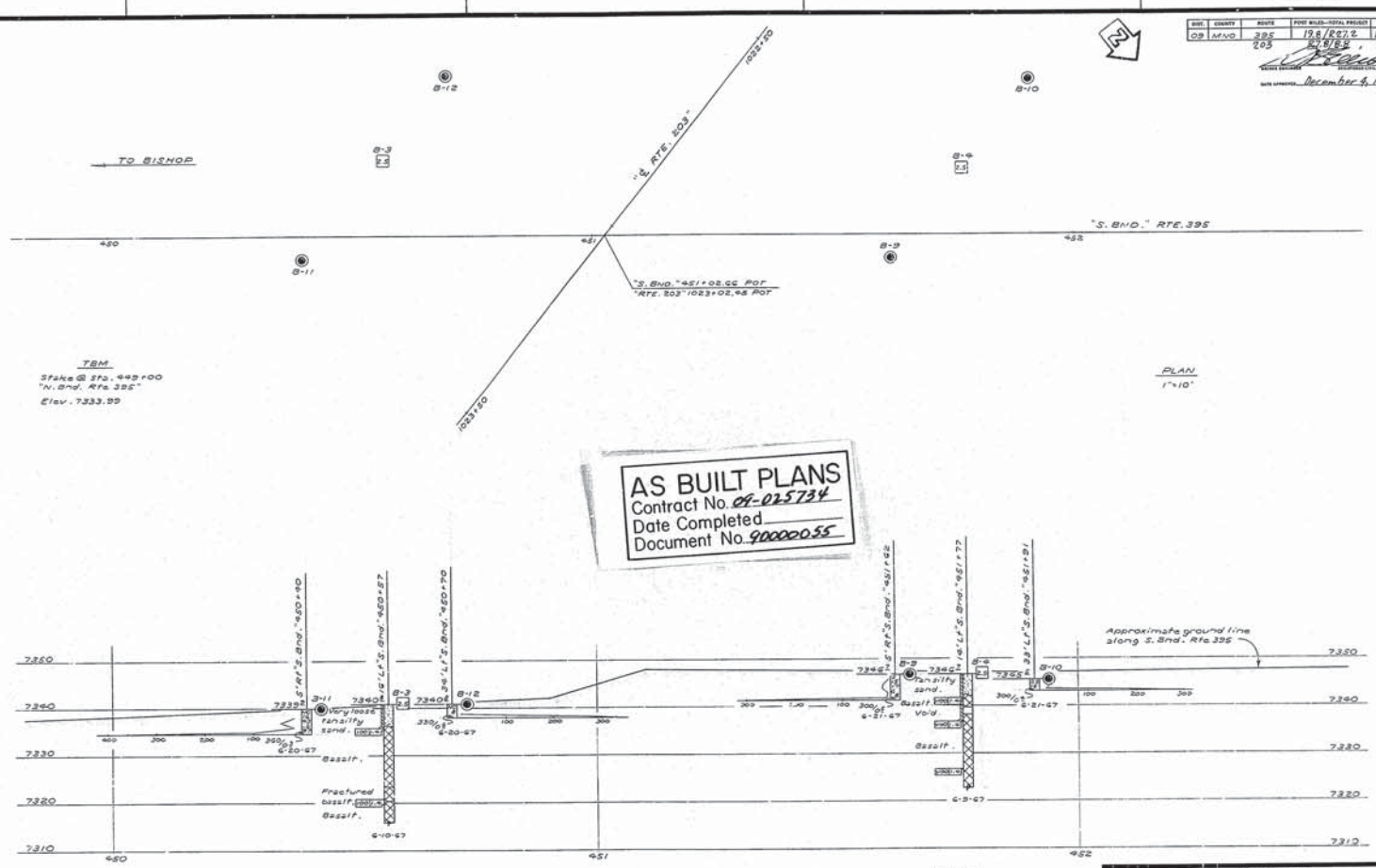
Plate 3

09-MNO-395 PM 25.2/25.84
MAMMOTH CMS

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET	TOTAL SHEETS
09	MNO	395 203	19.8/R27.2	88	100

REVISED DATE 12/8/65

DATE APPROVED December 4, 1968



NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION
DATE June, 1967

AS BUILT None
CORRECTIONS BY M. Sheffield (L.F.) 11-18-69
CONTRACT NO. 09-025734
DATE 7-22-69

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROUTE 395/203 SEPARATION

LOG OF TEST BORINGS 1 OF 2

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
47-50 L	25.7	4750-11	11	12

REVISION DATES (PRELIMINARY STAGE ONLY)

WO 025731
CU 09201
PR-4750-2

Disregard prints bearing earlier revision dates

LEGEND OF BORING OPERATIONS

Penetrometer
Rotary Core Penetrometer
Sonic Borings (Jet)
Rotary Borings (Jet)
Auger Borings (Dry)
Jet Borings
Core Borings
Test Pit
Penetration Resist.
Rotary Resist.
Jet Resist.
Jet Soil Type

LEGEND OF EARTH MATERIALS

Gravel, Sand, Silt, Clay, Silty or Clayey Silt, Sand, Silty or Clayey Sand, Fill Material, Igneous Rock, Sedimentary Rock, Metamorphic Rock, Stony Soil or Soft Rock

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

Boulder material has more than 50% of its volume or more than 50% of its surface area larger than 12" diameter.

Cobble material has more than 50% of its volume or more than 50% of its surface area between 3" and 12" diameter.

"Gravel" Coarse Fine

"Sand" Coarse Medium Fine

"Silt" or "Clay" Passes 200 sieve, size cannot be determined by eye.

Sieve sizes are standard sieve sizes.

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

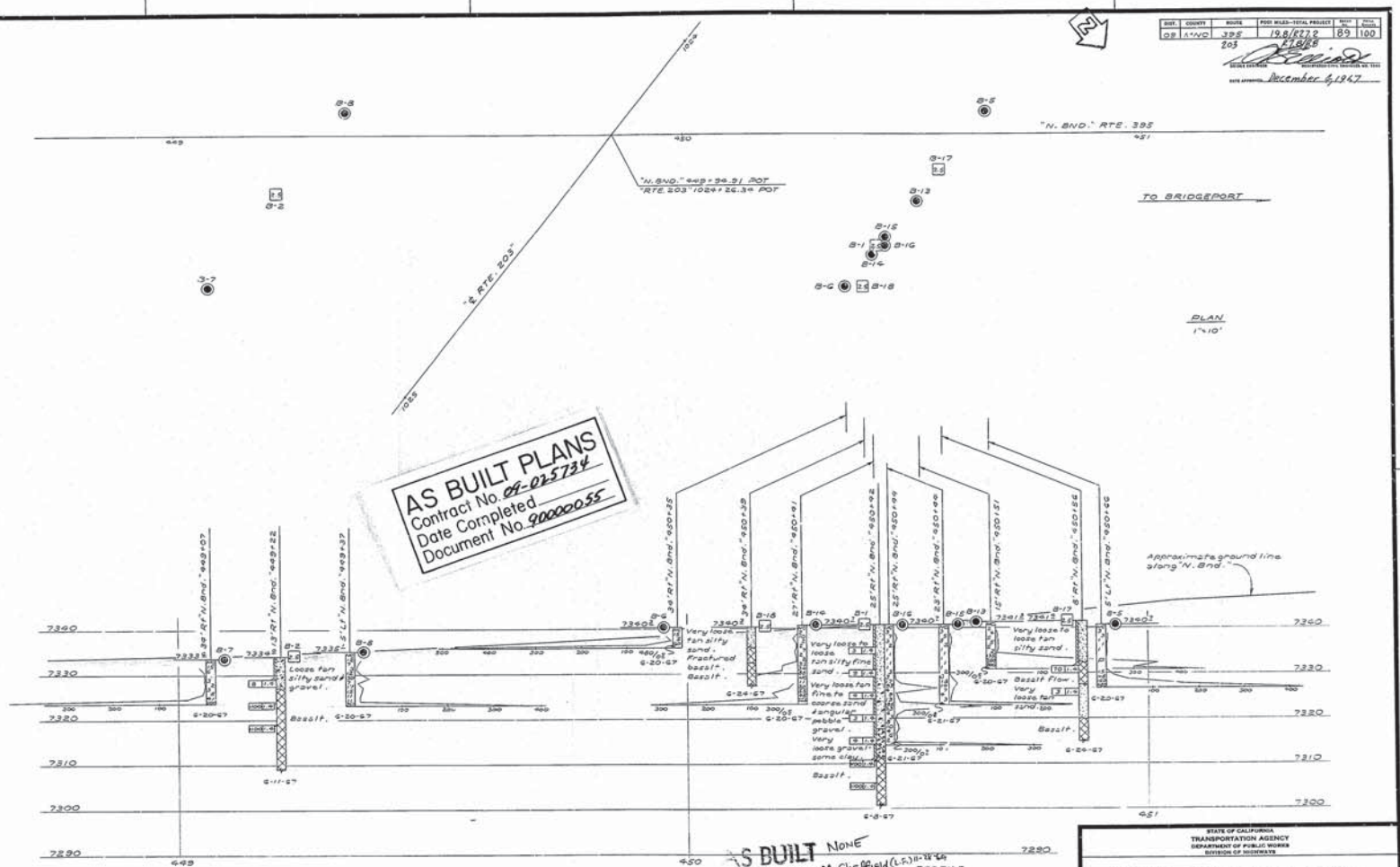
FIELD STUDY N. Elsbury 5-1-67
DRAWN N. Elsbury 5-22-67
CHECKED N.E. Beeston 7-1-67
Approved for Bridge Dept. [signature]
Engineering Geologist

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

88

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
09	MNO	395 203	19.8/27.2	89	100

December 6, 1967



NO GROUND WATER ENCOUNTERED DURING THIS INVESTIGATION BY BRIDGE DEPT. GEOLOGY SECTION DATE June, 1965

AS BUILT NONE
CORRECTIONS BY M. Sheffield (L.S.) 11-28-69
CONTRACT NO. 09-025734
DATE 7-15-69

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROUTE 395/203 SEPARATION

LOG OF TEST BORINGS 2 of 2

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
47-50 R	25.7	4750-12	12	12

LEGEND OF BORINGS OPERATIONS

LEGEND OF EARTH MATERIALS

CLASSIFICATION OF NATURAL SOILS AS STANDARD GRADE SIZE LIMITS

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY N. J. Rowley 5-67
DRAWN N. J. Rowley 5-67
CHECKED N. J. Rowley 5-67
Layout Formatted by Gilbert Gerwell

89

WO 025731
CU 09201
PR-4750-2A

Stengard prints bearing earlier revision dates →