Soil and Rock Logging

Soil and rock logging must be performed in accordance with the current version of the *Soil and Rock Logging, Classification, and Presentation Manual*.

Log of Test Borings

The Engineering Graphics Unit (EGU) drafts Log of Test Borings (LOTB) plan sheets. LOTBs are prepared for individual structures and are included as part of the plan set. Therefore, submittals to the EGU are organized by structure and include the following for each:

- LOTB Job Request
- Field Log(s)
- Plan with boring location(s) plotted and labeled
- Electronic .dgn site plan or general plan
- Level notes with benchmark information (may alternatively be shown on the LOTB Job Request)
- A signed copy of any required exceptions

The EGU will prepare LOTB check prints and will return them to the requestor for review. The requestor lines out deletions and adds new or revised text written clearly in RED.

Prior to finalizing the LOTB, the geoprofessional is required to complete the LOTB QC/QA process and submit a copy of the LOTB QC/QA Signature Sheet to the Engineering Graphics Unit prior to LOTB distribution.

LOTB Job Request

An LOTB Job Request form, approved by the branch senior, is required for each Structure and/or Roadway component (e.g., individual landslide, cutslope, settlement area etc.). A blank LOTB Job Request form is available on the EGU web page.

Field Logs

A variety of formats are used by the geoprofessional to record soil and rock information during drilling operations. The preferred format is available on the EGU web page. Field logs are not to be retained once the design is complete and all products (e.g., LOTB, boring record, reports) are submitted to the client. Regardless of the format used, the field log submitted to the EGU is to include the following information, if applicable.

- ☐ LOTB Title
- ☐ Hole Identification
- ☐ District, County, Route, Postmile
- ☐ Bridge number
- ☐ EA number, project ID
- ☐ Drilling Crew
- ☐ Drilling Equipment
- ☐ Drill CHC number
- ☐ Page number
- ☐ Location
- ☐ Elevation
- ☐ Groundwater surface
- ☐ Groundwater date
- ☐ Hammer efficiency
- ☐ Casing size
- ☐ Casing depth
- ☐ Drill bit size
- ☐ Sample number
- ☐ Sample depth
- ☐ SPT blows
- ☐ SPT N
- ☐ Depth of material change
- ☐ Soil/Rock description
- ☐ Laboratory Test Symbols
- ☐ Bottom of hole depth

The following table presents additional information relating to each item required on the Field Log.

LOTB Title	LOTB Title is shown on the first page of each field log and matches the structure name used by the structure designer.
Hole Identification	Hole Identification (Section 2.4 of the 2010 Logging Manual) is shown on all pages of each field log.
District, County, Route, Postmile	District, County, Route, Postmile is shown on the first page of each field log.
Bridge Number	Bridge number is shown on the first page of each field log
EA, Project ID	EA and/or Project ID is shown on the first page of each field log
Drilling Crew	Names or initials of the drilling crew are shown on the first page of each field log
Drilling Equipment	Description of drilling equipment is shown on the first page of each field log, e.g., Mobile B-47
Drill CHC Number	Drill CHC number is shown on the first page of each field log
Page number	Each field log sheet is numbered with page number and total number of sheets e.g., 2/4, indicating the field logs totaled 4 sheets and this is sheet number 2.
Location	The boring location is shown on the first page of each field log. Location is expressed in station and offset and should be determined in the field using features shown on the plan sheet. For projects with no reference line, e.g., maintenance stations, location is referenced to the accompanying plan, e.g., “as shown on plan”.

Elevation	Top of hole elevation reported to one decimal place.
Groundwater surface	Each boring must show either a measured groundwater depth or elevation (usually depth) or a positive groundwater statement. See section 5.2.3.4 h) of the logging manual.
Groundwater date	Show date(s) of groundwater measurement. Show multiple dates and measurements only if there is significant variation, and then show only the maximum and minimum depths.
Hammer efficiency	The hammer efficiency is shown on the first page of each field log or at the end of the field log.
Casing size	Show the size of casing.
Casing depth	Show the depth to which casing was extended.
Drill bit size	Provide the outside diameter of the bit used to drill the hole. Note that this is not “94mm” when you are using the 94 mm wireline drilling method. The bit size can be determined by measuring with a tape measure or by asking the driller.
Sample number	Provide the sample number for each SPT or other sample.
Sample depth	Provide the starting and ending depth for each numbered sample.
SPT blows	Provide the blowcounts for each 6” increment of the SPT. See section A.8 of the logging manual.
SPT N	Provide the SPT N value. See section A.8 of the logging manual for examples of refusal or early termination of the test.
Depth of material change	Provide the depth/elevation where material changes occur and the nature of the change e.g., whether the change was directly observed (solid line), estimated (dashed line), or the rock-soil boundary.
Soil/Rock description	Provide final (incorporating laboratory results) soil/rock identifications and descriptions in accordance with the logging manual. For soils this includes (at a minimum); • Group Name • Group Symbol • Consistency (for cohesive soils) • Apparent Density (for granular soils)

	• Color from the Munsell color charts • Moisture, either dry, moist or wet • Percent or proportion of each soil component reported in order of decreasing abundance. For Gravel, report the predominate particle size (fine or coarse). For sand report the predominate particle size (fine, medium or coarse). • Report cementation of coarse-grained soils only if they are chemically cemented. • If cobbles and or boulders are present report the percent (numerically to the nearest 5%) and describe the rock type or name, hardness and size. • For fine-grained soils report the consistency field test result, usually pocket penetrometer or torvane. For rock include (at a minimum) • Rock Type • Rock Name • Rock Grain Size (for coarse-grained sedimentary rock only) • Bedding Spacing (for sedimentary rock only) • Color • Weathering • Rock Hardness • Fracture Density • Core Recovery • RQD For both soil and rock ensure that the rules for layer presentation are followed.
Laboratory Test Symbols	Show the appropriate laboratory test symbol (section 5.2.5 of the 2010 Logging Manual) and the corresponding depth or elevation for each test.
Bottom of hole depth	Show at end of field log. Note that the bottom of boring is not necessary the drilled depth, it could be the depth of the final SPT.

<u>Plan with boring locations plotted and labeled</u>

This is usually the general plan, foundation, or other site plan. This assists drafting in choosing the start and end of the layout line shown in the plan view and also provides a

check to ensure that the boring locations are correct. Borings are plotted using the borehole identification symbol (see figure 5-3 of the logging manual) and borehole identification H-YY-NNN (see section 2.4 of the logging manual).

Electronic .dgn site plan or general plan

This is the current plan and is the same plan used to plot the borings. For cases where the LOTB request was submitted well in advance of the actual drafting date, EGU will contact the Project Engineer to inquire if a newer plan is available, and if so will contact the geoprofessional who will check to see if all previously submitted material is still valid, e.g., if the alignment has changed after initial submittal, the geoprofessional would need to redo the boring locations to reflect the new alignment.

Exceptions

If there are deviations from the requirements of the *Soil and Rock Logging, Classification, and Presentation Manual* contained in the submitted field log(s) then include:

- A signed copy of the *Request for Exception* form

Exceptions are requested prior to drafting. If logs require an exception due to logging deficiencies, the deficiencies should be identified by the geoprofessional and/or the branch chief prior to LOTB submittal.

- Text documenting exception(s) to be placed on the LOTB

Text documenting exceptions is placed under the signature block and modifies the standard note e.g., “This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (2010) with the following exceptions: RQD is not shown, particle size is not shown (section 2.5.8).