

# Chapter 4

## Bridge Program Drawings

### Section 4.06-Geology

#### Introduction

The Log Boring Sheet contains information critical to the design and construction of a structure. Subsurface information logged by the Geology Program is included with a summary of laboratory test data. This data, along with a Geology Report, is utilized by the Bridge Program for the design of foundations to support structural loads. Information found on the Log Boring Sheet and in the Geology Report is used on the Preliminary Layout, General Notes, and General Plan and Elevation sheets.

Detailing of the Log Boring Sheet is done by Geology Program personnel. Bridge Program detailers are responsible for the information placed in the title blocks of the sheet.

#### Explanation of Details

The **LOG BORING SHEET** is used by the Bridge Program as reference for designing and detailing structures. A plan and elevation are drawn to scale, and the existing structures, if present, are shown.

The **PLAN** locates test holes in relation to the centerline survey, the channel, and railroad and/or road it crosses. Test hole locations are shown along with the existing ground line elevation at each hole.

The **ELEVATION** shows an approximate cross section of subsurface materials. Test holes are shown full depth with sample number and type of test adjacent to each hole. The number of blows required to drive the point through the penetrated materials is shown for penetration and drive point tests. Bedrock (weathered and/or unweathered), ground water, existing ground surfaces, and subsurface material descriptions are shown.

Additional information about the test holes can be obtained from **SUMMARY OF LABORATORY TEST DATA** included on the Log Boring Sheet.

## Explanation of Geology Report

The **GEOLOGY REPORT**, in conjunction with the Log Boring Sheet, is submitted to the Bridge Program by the Engineering Geologist. The content of the report may include an introduction, general information, recommendations, and a scour gradation analysis, all of which are crucial to the design and detail of structures.

Included in the **INTRODUCTION** are the date of the geology investigation, equipment used, description of environmental conditions such as weather, water, terrain/access, and materials encountered that can cause drilling and sampling problems. In addition, a list of samples is submitted to the Materials Program for analysis (i.e., alkali and channel material).

Included in the **GENERAL** information are the geologic and hydrologic history of the region, description of existing structures, ground water elevation, material suitable for riprap, and a general description of the foundation materials encountered.

Included in the **RECOMMENDATIONS** are the basic substructure types - footings, piling, and drilled shaft foundations. Allowable values shown include the AASHTO required factors of safety. A table listing LRFD design criteria is also included.

Recommendations for **FOOTINGS** include allowable and ultimate bearing and coefficient of friction at or below recommended elevations. Construction requirements such as scour depths, shoring, dewatering, and type of excavation are also noted.

Recommendations for **PILING** include desired pile tip elevations at which driving refusal and design refusal are reached, skin friction and uplift values, the necessity for pile points, preboring, and pile dynamic analyzer (PDA) testing.

Recommendations for **DRILLED SHAFT** foundations include allowable lateral bearing, end bearing, skin friction, and uplift values at desired tip elevations for drilling and construction requirements such as casing, placing of concrete under water, and possible drilling problems.

Special hazards existing above the recommended foundation elevations may include scour, insufficient bearing resulting in structure settlement, and large boulders. Such hazards may preclude a particular foundation from being utilized.

The **SCOUR GRADATION ANALYSIS** is a graph describing channel material. The grain size is plotted in relation to the relative percentage of fines by weight of the material yielding a curve of the soil composition. This analysis may identify potential scour hazards.

## Miscellaneous Reports

The **ALKALI REPORT** is a job-specific guide used by the Design Engineer for the type of cement required in the concrete mix design. The Materials Program submits this report to the Bridge Program. The Alkali Samples are requested on the Preliminary Geology Layout (see Section 4.02 - General Notes). The Corrosion Resistance Table shown in Section 4.02 - General Notes shall be used when selecting the proper cement type and class of concrete.

## Final Geology Review

The **FINAL GEOLOGY REVIEW**, for bridges only, is submitted by the Bridge Program to the Engineering Geologist at the completion of the design and detailing on a project. The submittal is composed of a **FINAL GEOLOGY REVIEW FORM** and a **FINAL GEOLOGY LAYOUT**. The Final Geology Layout is a copy of the Substructure Layout. The Layout needs to include all drill hole locations, substructure types and bottom elevations. For drilled shafts include the diameter and for piling include the size and grade.