Raney Geotechnical Inc.

October 23, 2023

Mr. Aleksey Zhirkov
7705 Hickory Avenue
Carmichael, California 95662

Geotechnical Engineering Report
7705 HICKORY AVENUE FIRE ACCESS
Orangevale, California 95662
File No. 4759-003

As requested, we have prepared this repot to evaluate the existing gravel access drive and provide geotechnical conclusions and recommendations for fire access support at the property at 7705 Hickory Avenue in Orangevale, California.

Our scope of work has included review of a *Access Exhibit for: 7705 Hickory Avenue* dated 9/9/2022 prepared by CNA Engineering, Inc; field exploration, including determining the thickness of the existing gravel access driveway, dynamic cone penetration (DCP) testing of the pavement subgrade soils, and sampling of the near-surface subgrade soils; laboratory testing consisting of Resistance value (R-value) of the near-surface soils in accordance with California Test 301; engineering analysis; and, preparation of this report.

Project Description

Based on our correspondence, we understand Sacramento County Metropolitan Fire District requires the existing access driveway support an 80,000 pound fire apparatus before the property can be subdivided. In addition, we understand the existing gravel access drive may be widened in several locations and a new gravel access drive will be constructed extending north from the existing driveway. The widened areas and new access drive will also need to support an 80,000 pound fire apparatus.

Site Description and Soil Conditions

Based on our observations, the driveway is generally divided into three parts. The first part (Part One) is a gravel-covered roadway that extends west from Hickory Avenue. The gravel surface consists of a mixture of aggregate base and asphalt concrete grindings. In general, the gravel surface within Part One is relatively cemented and well compacted.

The second part (Part Two) extends further west from Part 1 and consists of an asphalt concrete roadway that leads to the existing residential structure at the west end of the property.

The third part (Part Three) of the fire access area extends north from the Part Two access drive and consists of vacant land that is covered in soil and low-lying grasses.

Based on our observations and measurements, the gravel thicknesses along Part One of the existing driveway are noted in the table below. The locations (S1 through S5) are indicated on the attached Plot Plan (Figure 1).

Existing Gravel Driveway Thicknesses

Part One Driveway Area	Gravel Thickness (inches)
S1	6
S2	12+
S3	9
S4	6
S5	9

The soil conditions encountered below the existing gravel sections generally consists of relatively dense, cemented, silty sands. Cemented silty sand was also observed at the existing ground surface within the Part Three section of the driveway. DCP testing of the gravel driveway and underlying soil conditions indicates the existing gravel roadway provides relatively high California Bearing Ratio (CBR) values and the near-surface subgrade soils are good quality materials for support of pavements.

R-value testing of the near-surface subgrade soils indicates these soils are good subgrade quality materials for support of pavements. Laboratory testing revealed the surface and near-surface soils possess an R-value of 46 (see Figure 2). An R-value of 40 is considered appropriate for evaluation of the existing gravel pavements and new pavement design at the site.

Existing Driveway Support

Based on the condition of the existing gravel roadway, the soil conditions underlying the gravel, the results of the DCP testing, and the results of the R-value laboratory testing, in our opinion, the existing gravel roadway is considered suitable for support of fire apparatus weighing up to 80,000 pounds.

In addition, the existing asphalt concrete driveway section (Part Two of the site) is considered suitable for support of fire apparatus weighing up to 80,000 pounds.

New Aggregate Base Pavement Recommendations

In areas where new pavements will be required (i.e., where the existing driveway will be widened and within Part Three of the site) we recommend the pavement section consist of at least six inches of Caltrans Class 2 aggregate base to provide adequate support for the anticipated fire apparatus equipment and to meet the fire department requirements. Recycled aggregate base is considered suitable for use at the site.

The proposed aggregate base should be compacted to at least 95 percent of the American Society of Testing and Materials (ASTM) and the pavement areas should be adequately sloped to promote drainage such that water does not pond on or adjacent to the pavement areas. Note that compaction of new aggregate base may be performed using static equipment provided the aggregate base is placed in relatively thin lifts and at or near the optimum moisture content at the time of compaction.

New aggregate base should be placed over a firm and stable subgrade, as determined by our representative. In areas that are not firm and stable at the time of aggregate base placement, processing and compaction of the subgrade may be required. The need to process and re-compact the existing subgrade should be determined by our representative prior to aggregate base placement. If required, additional recommendations can be provided during construction.

Note that without a protective hard course layer (i.e., asphalt concrete or concrete), increased pavement maintenance may be required due to the potential for water to infiltrate into the aggregate base/gravel layer and/or subgrade.

Provided the aggregate base pavements are constructed as noted above and the existing gravel and new aggregate baes pavements are periodically maintained, in our opinion, the existing gravel pavements and new aggregate base pavements will be capable of supporting an 80,000 pound fire apparatus on an intermittent basis.

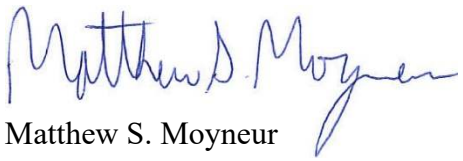
Limitations

Our recommendations are based upon the information provided regarding the proposed project, combined with our analysis of site conditions revealed by our observations. We have used engineering judgment based upon the information provided and the data generated from our study. This report has been prepared in substantial compliance with generally accepted geotechnical engineering practices that exist in the area of the project at the time the report was prepared. No warranty, either express or implied, is provided.

We emphasize that this report is applicable only to the investigated site. This report should not be utilized for construction on any other site.

Very truly yours,

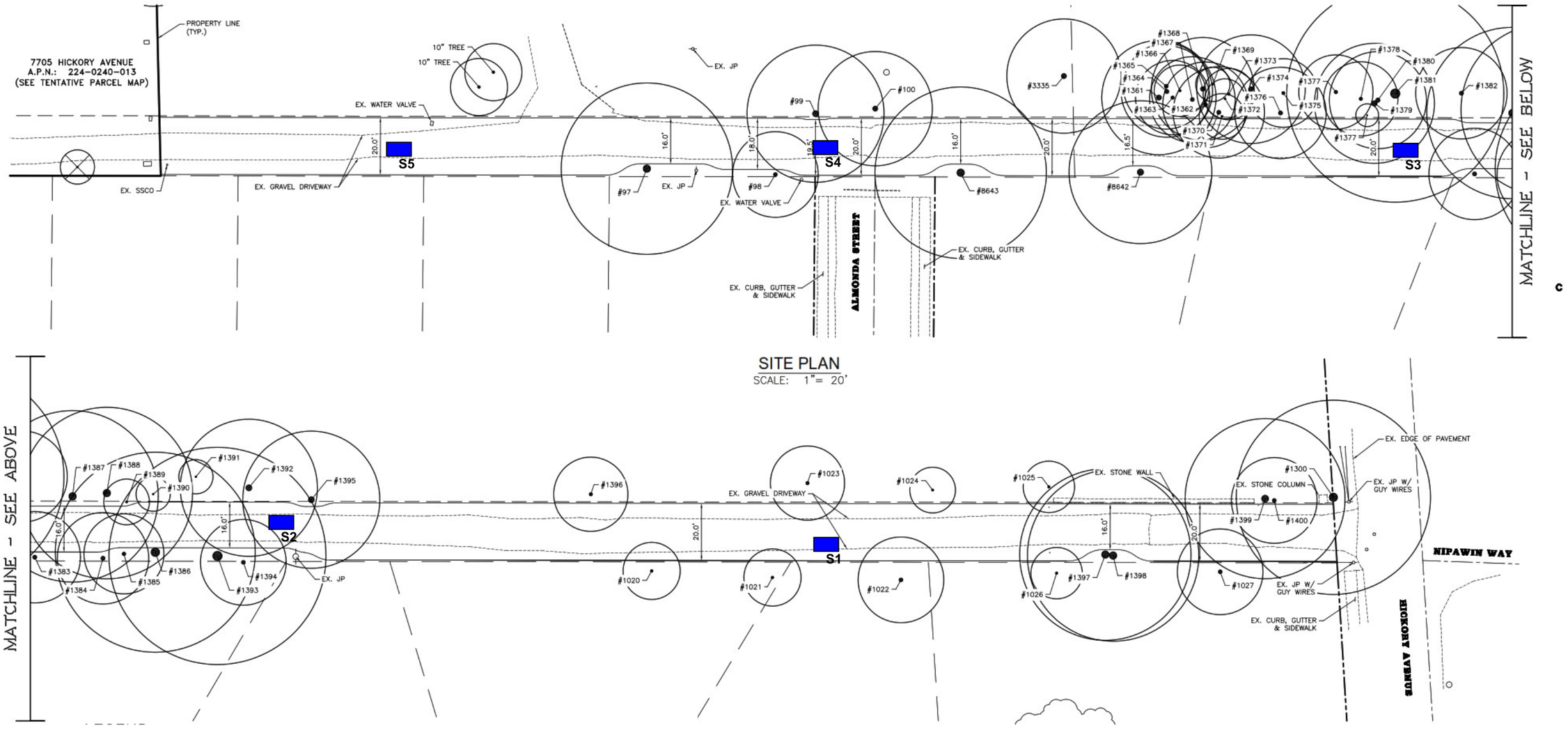
RANEY GEOTECHNICAL, INC



Matthew S. Moyneur
Senior Engineer

Attachments: Figure 1 – Plot Plan
Figure 2 – Resistance Value Data

PROJECT NUMBER: 4759-003



NOTES:
1. SAMPLE LOCATIONS SHOWN ARE APPROXIMATE.
2. PREPARED FROM AN ACCESS EXHIBIT PREPARED BY CNA ENGINEERING INC. DATED 9/9/2022.

KEY:

S1 SAMPLE LOCATION AND NUMBER

PLOT PLAN

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FIGURE 1

Project Number: 4759-003

RESISTANCE VALUE TEST
CALIFORNIA TEST METHOD 301

SAMPLE LOCATION: Composite Sample of S1 through S5
DEPTH: 1' – 2'
MATERIAL DESCRIPTION: Brown, Silty Sand (SM)

TEST NUMBER	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	EXUDATION PRESSURE (PSI)	EXPANSION PRESSURE (PSF)	RESISTANCE VALUE
1	126.1	9.7	665	225	61
2	125.0	10.7	307	82	47
3	123.3	11.7	135	9	15

Resistance value at 300 psi exudation pressure =46

RESISTANCE VALUE DATA

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Figure 2