APPENDIX D
Geotechnical Report

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SOIL SURVEYS GROUP INC.

103 CHURCH ST • SALINAS, CALIFORNIA 93901 • TELEPHONE (831) 757-2172

June 7, 2019
Job #7120

Joby Aviation
Attn: Amy Gross
340 Woodpecker Ridge
Santa Cruz, CA 95060

Dear Ms. Gross:

Submitted herewith is the report of our Geotechnical Investigation for the proposed canopy tent addition to the Marina Airport located at 3200 Imjin Road, APN 031-111-037, in Marina, California. Five borings were drilled on May 15, 2019, for geotechnical investigation purposes. Laboratory tests were subsequently made on driven soil core samples taken from the boring to determine the near surface and subsurface soil conditions and suitability for the construction of the proposed addition. We find that the project site is suitable for the proposed use with the recommendations made herein.

It is a pleasure working with you on this project. If you have any questions regarding our geotechnical investigation or this report, please contact us.

Very truly yours,

SOIL SURVEYS GROUP, INC.

REGISTERED PROFESSIONAL ENGINEER BELINDA A. TALUBAN No. 44217 Exp. 6/30/21 CIVIL STATE OF CALIFORNIA

Belinda A. Taluban, P.E.
R.C.E. 44217

CERTIFIED ENGINEERING GEOLOGIST MICHELLE GARCIA No. 2668 exp 3/31/21 STATE OF CALIFORNIA

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Engineering Geologist 2668

BAT/MMG/ke

cc. City of Marina

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SOIL SURVEYS GROUP INC.
103 CHURCH ST • SALINAS, CALIFORNIA 93901 • TELEPHONE (831) 757-2172

GEOTECHNICAL INVESTIGATION

FOR THE PROPOSED CANOPY TENT ADDITION

TO BE LOCATED AT 3200 IMJIN ROAD

APN 031-111-037

MARINA, CALIFORNIA

JOBY AVIATION

JULY 7, 2019; JOB #7120

I. INTRODUCTION:

This Geotechnical Investigation was made to determine the suitability of the soils at the project site for the proposed canopy tent addition to the Marina Airport located at 3200 Imjin Road, APN 031-111-037, in Marina, California. Five borings were drilled on May 15, 2019, for geotechnical investigative purposes. Core samples were taken from the borings for laboratory testing. The boring logs, our field observations, and field and laboratory test data were analyzed to determine the following:

1. **Suitability of the soils at the project site for the proposed canopy addition.**
2. **Unsuitable or unstable soil conditions, if any.**
3. **Foundation design criteria for the proposed canopy addition.**
4. **Subsurface groundwater and soil moisture considerations.**
5. **Surface drainage considerations.**
6. **Analysis of seismic hazards and seismic design factors per the 2016 California Building Code.**

II. LABORATORY TEST DATA[1]:

Thirty moisture density tests were made from the driven core samples. Standard Penetration Tests (SPT) were performed with a Terzaghi Split Spoon sampler. The samplers were driven into the soil by a 140 lb. hammer dropped a vertical distance of 30 inches at the sample location. Results of these tests are shown as follows:

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[1] Boring Logs are located in Appendix A

MOISTURE DENSITY TESTS					
Boring No.	Depth/ Ft.	Water Content %	Dry Density p.c.f.	Standard penetration Tests, Blows /foot	Pocket Penetrometer Tons S.F.
B-1	2-2.5	3.2	91.4	29	---
B-1	4-4.5	4.0	107.3	23	---
B-1	6-6.5	5.2	113.0	28	---
B-1	9.5-10	4.4	109.7	36	---
B-1	14.5-15	3.6	106.7	64	---
B-1	19.5-20	4.0	91.2	56	---
B-2	2-2.5	3.7	110.4	33	---
B-2	4-4.5	3.5	100.6	17	---
B-2	6-6.5	5.7	122.2	16	---
B-2	9.5-10	3.9	112.4	32	---
B-2	14.5-15	3.6	114.9	78	---
B-2	19.5-20	3.5	102.9	46	---
B-3	2-2.5	6.8	106.4	46	---
B-3	4-4.5	7.8	112.4	64	---
B-3	6-6.5	7.9	125.4	41	0.5
B-3	9.5-10	5.3	105.1	8	---
B-3	14.5-15	4.2	111.0	29	---
B-3	19.5-20	3.5	105.9	48	---
B-4	2-2.5	7.8	97.2	60	---
B-4	4-4.5	9.3	109.1	74/11"	---
B-4	6-6.5	9.6	126.4	83	---
B-4	9.5-10	6.1	112.1	45	---
B-4	14.5-15	5.9	115.9	23	0.5

B-4	19.5-20	3.7	85.9	44	---
B-5	2-2.5	4.8	110.5	23	---
B-5	4-4.5	5.6	105.0	33	---
B-5	6-6.5	4.9	99.8	31	---
B-5	9.5-10	4.5	101.5	26	---
B-5	14.5-15	4.5	104.4	44	---
B-5	19.5-20	6.0	103.3	42	---

Six Sieve Analysis tests were made on driven core samples. Results of these tests are shown as follows:

A.S.T.M. D 422 SIEVE ANALYSIS TEST-Percent Passing

Boring No.	Depth/ Ft.	Sieve No. 4	Sieve No. 10	Sieve No. 20	Sieve No. 30	Sieve No. 40	Sieve No. 100	Sieve No. 200
B-1	2-2.5	100	100	90	61	39	10	5
B-2	4-4.5	100	100	99	92	70	4	2
B-3	2-2.5	100	100	97	84	61	14	10
B-3	6-6.5	100	99	95	81	59	18	13
B-4	3.96-4.46	100	100	99	90	70	15	10
B-5	2-2.5	100	100	98	82	53	8	5

Six plasticity index tests were performed on driven core samples. Results of these tests are as follows:

PLASTICITY INDEX TEST

Boring No.	Depth/ Feet	% Passing Sieve No. 40	% Passing Sieve No. 200	Liquid Limit	Plastic Limit	Plasticity Index
B-1	2-2.5	39	5	n/p	non-plastic	n/p
B-2	4-4.5	70	2	n/p	non-plastic	n/p
B-3	2-2.5	61	10	n/p	non-plastic	n/p
B-3	6-6.5	59	13	n/p	non-plastic	n/p
B-4	3.96-4.46	70	10	n/p	non-plastic	n/p
B-5	2-2.5	53	5	n/p	non-plastic	n/p

The test results for samples taken from the borings indicate that the fine fraction of the near surface silty, fine to coarse grained sands encountered in the Borings are non-plastic and non-expansive.

Boring 1 was located within the southwest corner of the proposed addition location, as shown on Figure II. Below four inches of asphaltic concrete, the near surface soil consists of medium dense, fine to coarse grained sand to a depth of five feet, underlain medium dense to very dense, fine to medium grained sand to the bottom of the boring at 20 feet in depth.

Boring 2, was located within the middle of the proposed addition location, as shown on Figure II. Below 10 inches of concrete, the near surface soil consists of dense, slightly silty, fine to coarse grained sand to a depth of 6.5 feet, overlying dense to very dense, fine to coarse grained sand to the bottom of the boring at 20 feet in depth.

Boring 3 was located within the northwest corner of the proposed addition location, as shown on Figure II. Below 10 inches of concrete, the near surface soil consists of dense to very dense, silty, fine to medium grained sand fill to a depth of eight feet, underlain by loose to dense, fine to medium grained sand to the bottom of the boring at 20 feet in depth.

Boring 4 was located within the northeast corner of the proposed addition, as shown on Figure II. Below 10 inches of concrete, the soil consists of medium dense to dense, silty, fine to medium grained sand to 15 feet in depth, overlying dense, fine to medium grained sand to the bottom of the boring at 20 feet in depth.

Boring 5 was located within the southeast corner of the proposed addition, as shown on Figure II. Below two to three inches of asphaltic concrete, the near surface soil consists of medium dense to dense, fine to medium grained sand to the bottom of the boring at 20 feet in depth.

No free groundwater was observed in the borings to a maximum explored depth of 20.0 feet. The actual depth to groundwater during rainy months is unknown, but it should be noted that groundwater fluctuations can occur due to variations in rainfall, temperature and other factors not evident during the time of our investigation.

III. SUITABILITY OF SITE FOR PROPOSED USE:

No unsuitable or unstable soil conditions were found at the borings. In our opinion, the site is suitable for the proposed canopy tent addition with the recommendations made herein.

IV. RECOMMENDED FOUNDATION DESIGN CRITERIA:

Spread footings may be used for the building foundation after the site is cleared, grubbed and the proposed building pad are graded, compacted and properly prepared. Spread footings shall be installed to a minimum depth of 18 inches for the proposed addition. The minimum depths shall be measured from the **inside building pad soil subgrade.**

Allowable foundation pressures after compaction of the building pad area are:
Continuous footings = 2000p.s.f.
Isolated rectangular footings = 2200 p.s.f.

Allowable lateral bearing pressure = 150 p.c.f

Continuous footings shall be reinforced with two #4 steel reinforcement bars, placed near the bottom of the footing. Spread footings shall also meet the minimum requirements of the 2016 California Building Code and the City of Marina Building ordinances for width, thickness, embedment and reinforcement steel. The new addition and any future building additions shall be designed in strict accordance with the requirements specified in the 2016 California Building Code, or latest approved edition, to resist seismic forces.

Any concrete floor slabs-on-grade shall be a minimum of six inches thick and shall be reinforced with a minimum of #3 steel reinforcement bars at 16 inches on center or #4 steel reinforcement bars placed 30 inches on center, each way and shall extend into perimeter foundation. *The reinforcement steel must be firmly held in the vertical center of the slabs during placement and finishing of concrete with pre-cast concrete dobies.* Any new concrete floor slabs-on-grade shall be underlain by an approved 15 mil. vapor barrier installed over a minimum four inch thick open graded gravel capillary break with two inches of clean sand placed over the vapor barrier as recommended in Section VII-C herein. ***Concrete slabs shall have weakened plane joints a maximum of fifteen feet on center, each way. All concrete shall be properly cured with an approved curing compound or wetted burlap for a minimum of 14 days.***

Soil Surveys Group, Inc. shall inspect and approve the foundation footing excavations and the subgrade beneath concrete floor slabs for suitable soil bearing and proper penetration into competent soil. We also recommend that Soil Surveys Group, Inc. review and approve the grading, drainage and foundation plans prior to building construction.

A. Concrete Sidewalks and Outside Flatwork:

We recommend that any new on-site concrete sidewalks and outside flatwork be at least five inches thick and be placed over a compacted subgrade. All concrete flatwork should be divided into as nearly square panels as possible. Frequent joints should be installed to provide articulation to the concrete panels. Landscaping and planters adjacent to concrete flatwork should be designed in such a manner that positive drainage away from the new project buildings is achieved. It is assumed that the outside concrete flatwork will be subjected only to pedestrian traffic.

V. LOOSE SOIL MITIGATION:

To mitigate the effects of the loose and slightly expansive near surface soil conditions, the following measures are recommended:

1. Any existing loose soil within the proposed building pads and extending a minimum of five feet in all directions outside of the proposed building foundations shall be recompacted **as necessary** to 90 percent relative compaction at the direction of Soil Surveys Group, Inc. prior to placing additional building pad fill or finishing the building pad subgrade. Soil Surveys Group, Inc. shall determine the depth of recompaction within the building perimeter, if any. Subexcavation and recompaction should be extended under any proposed patios or other permanent flatwork.

2. Spread footings shall be constructed a minimum of 18 inches deep for the proposed canopy as measured from the lowest adjacent grade, and continuous non-retaining footings shall be reinforced with two #4 reinforcement bars on the bottom.

3. Any new concrete floor slabs-on-grade shall be a minimum of six inches thick and shall be reinforced with a minimum of #3 steel reinforcement bars at 16 inches on center or #4 steel reinforcement bars at 30 inches on center, each way and shall be bent to extend a minimum of eight inches into the perimeter footing.

4. Any roof and site rain water should be directed away from the proposed building foundations. Rainfall runoff must not be allowed to collect or flow in a downslope direction against any building foundation.

5. Soil Surveys Group, Inc. shall be retained to inspect and test the recompaction of any loose native soil and new engineered fill within the building pad perimeter and shall inspect and approve foundation excavations for soil bearing conditions. Soil Surveys Group, Inc. shall also inspect and approve the subgrade below concrete floor slabs prior to placement of reinforcing steel and shall inspect and approve the installation of any roof and yard drainage facilities.

VI. SURFACE AND SUBSURFACE DRAINAGE AND EROSION CONSIDERATIONS:

The near surface soil at the project site has the potential to erode, especially if protective vegetation is removed. Therefore all new cut and fill slopes, as well as disturbed soil areas, must be seeded with grass or landscape plants for erosion control and to prevent sloughing soil from blocking drainage patterns at the project site. Such erosion control measures shall be taken during and at completion of grading and during building construction operations.

Concentrated storm water runoff from the project site should not be allowed to discharge uncontrolled onto sloping ground. Suitable energy dissipation systems shall be designed where rainfall runoff is concentrated, or the drainage water should be collected and piped to flat ground or discharged onto a rocked energy dissipater down slope of the existing building foundations. Rock energy dissipaters consisting of four inch to six inch diameter rock or rubble rip rap should be installed at collection pipe discharge points to reduce soil erosion. Rain gutter downspouts shall discharge onto concrete splash blocks, or shall discharge into collector pipes. The canopy site, any new paved areas and ground adjacent to any building shall be graded so that rainfall runoff does not become trapped or flow against any building foundations.

The boring logs do not indicate the need for a subsurface drain system. However, the Geotechnical engineer may recommend a system of subsurface drains should wet subsurface soil conditions be encountered during site preparation or excavations for any new building foundations.

VII. RECOMMENDED SPECIFICATIONS:

A. GRADING:

If grading work is to be performed, the building pad, extending a minimum of five feet in each direction past new foundation footings shall be cleared and grubbed of all surface vegetation, demolition debris, and organic topsoil before recompacting the original ground, placing engineered fill or finishing the subgrade for the new building pad. Any on site surface or subsurface grass, roots, deleterious material, or brush (if any) within any new building pad area shall be removed. Soil Surveys Group, Inc. should determine if any subexcavation is necessary after clearing and grubbing are completed. Any subexcavated soil shall then be backfilled in eight inch thick loose lifts and recompacted to 90 percent relative compaction, prior to placing engineered fill or finishing subgrade of the new building pads. If no subexcavation required, the subgrade shall be scarified 12 inches, moisture conditioned and recompacted.

Any new cut and fill slopes shall be 2:1 or flatter unless retained. The native soil is suitable to be used as engineered fill provided any organics or debris are first removed from the soil to be used as

fill. Any native soil used for fill, or any imported fill soil for any new building pads shall be compacted to at least 90 percent relative compaction, and any cut portions of the new building pads, if located within both cut and fill, shall be subexcavated a minimum of two feet, backfilled in eight inch loose lifts and recompacted to a minimum of 90 percent relative compaction. All fills placed on slope grades of 5:1 or greater shall be provided with a keyway excavated a minimum of two feet below grade, a minimum of 10 feet wide and at a 2% slope into the slope. The bottom of the keyway should be moisture conditioned, compacted (if necessary) and approved by Soil Surveys Group, Inc. prior to backfilling in eight inch loose lifts and compacting the backfill to 90 percent relative compaction. ***Grading, filling, compaction operations and foundation excavations shall be inspected and tested by Soil Surveys Group, Inc.***

B. COMPACTION:

Laboratory soils compaction test method shall be *A.S.T.M. D 1557-12.* Subgrade *in existing soil* beneath a new building pad shall be compacted to 90 percent relative compaction unless waived by the Geotechnical engineer. Subgrade soil below any new pavement shall also be compacted to 95 percent relative compaction, and aggregate base beneath new pavement shall be compacted to 95 percent relative compaction. Any imported sandy soil fill placed for the new building pads shall be compacted to a minimum of 95 percent relative compaction.

C. CONCRETE FLOOR SLABS-ON-GRADE:

Subgrade in recompacted soil under any new concrete floor slabs-on-grade shall be brought to at least 2% over optimum moisture prior to placing native or imported sandy soil fill, prior to placing the capillary break rock and moisture proof barrier or prior to pouring concrete. We recommend that a capillary break consisting of:

- a mat of clean, open graded rock, four inches thick, shall be placed over the finished soil subgrade,
- a minimum 15 mil. water-proof membrane (such as Stego, Moistop or equal) shall be placed over the open graded rock,
- two inches of clean, moistened sand shall be placed between the water-proof membrane and the bottom of the concrete floor slab. The moistened sand will help protect the membrane and will assist in equalizing the concrete curing rate to minimize shrinkage cracking.

Class 2 Aggregate Base or sand should not be used as the capillary break material. Capillary break material shall comply with and be installed according to the following:

1. MATERIAL:

   The mineral aggregate for use under the floor slabs shall consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination of the above. The aggregate shall be free of adobe, vegetable matter, loam, volcanic tuff and other deleterious materials. It shall be of such quality that the absorption of water in a saturated, surface dry condition does not exceed 3% of the oven dry weight of the sample.

2. GRADING:

   The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by laboratory sieves (U.S. Sieves) will conform to the following grading:

Sieve Size	Percentage Passing Sieve
⅜" to ½"	100
No. 4	0-10
No. 200	0-2

3. PLACING:
   Subgrade, upon which aggregate base, gravel or crushed rock is to be placed, shall be prepared by removing grass and roots. Where loose topsoil is present, it shall be removed and cleaned of debris and recompacted to 90 percent of maximum density.

4. THICKNESS AND STRENGTH:
   Concrete slabs should be at least six inches thick. Concrete shall be five sack minimum (5.5 sack if pumped) and shall achieve a 28 day compressive strength of at least 2500 p.s.i., or as specified by the project engineer.

5. REINFORCEMENT:
   Concrete slabs-on-grade shall be reinforced with a minimum of #3 steel reinforcement bars placed 16 inches on center, each way or #4 reinforcement bars placed 30 inches on center, each way and shall be bent to extend a minimum of eight inches into the perimeter footings.

D. UTILITY TRENCH BACKFILL:
All new on-site utility trenches shall be backfilled with a clean sand having a sand equivalent of 30 or higher. A two feet thick plug of compacted, **clayey soil backfill** or lean concrete shall be required around the pipe or conduit at places where utility trenches intersect the building perimeter. All trench backfill of imported clean sand or clean native sand shall be compacted to 95 percent relative compaction at all locations. Clean native sand shall be approved by Soil Surveys Group, Inc. prior to using for trench backfill.

VIII. GEOLOGIC AND SEISMIC CONSIDERATIONS:

Monterey County is in a seismically active area of the state of California. The following table provides a list of nearby faults that could produce an earthquake that could impact the project site.

Fault Name	Approximate Distance to Site	Orientation from Site	Data Source
Rinconada	1.00 km	Northeast	Uniform Building Code, 1997
Reliz (Concealed)	1.02 km	Southwest	Tinsley, 1975
Monterey Bay-Tularcitos	14.0 km	West	Uniform Building Code, 1997
Zayante-Vergeles	20.75 km	Northeast	Uniform Building Code, 1997

Fault Name	Approximate Distance to Site	Orientation from Site	Data Source
Gabilan Creek (Inferred)	21.19 km	Northeast	Dibblee, 1973C
San Gregorio (Sur Region)	26.0 km	Southwest	Uniform Building Code, 1997
San Andreas, Creeping Section (Pajaro)	27.0 km	Northeast	Uniform Building Code, 1997
Sargent	34.5 km	Northeast	Uniform Building Code, 1997

The canopy tent addition and any future building additions must be designed in strict compliance with the 2016 California Building Code to help withstand such seismically generated ground accelerations for a reasonably expected duration without suffering major damage.

The following are the project site coordinates and the seismic design criteria/coefficients per the requirements of the 2016 California Building Code (CBC):

Site Class	Latitude	Longitude	S_S	S_1	F_a	F_v
D	36.6744°	-121.7643°	1.546	0.553	1.00	1.50

Frame and semi-rigid structures with proper strengthening connections and hold-down fasteners (where needed) are recommended for the new addition and any future building additions. With proper design parameters, seismic damage to the building can be mitigated for major earthquakes centered near the project area.

Surface rupture, liquefaction, lurch cracking, lateral spreading, and differential settlement are seismic hazards that must be considered at the project site. Surface rupture usually occurs along fault lines, and no known faults have been mapped through the project site. Therefore, the potential for surface rupture or lurch cracking is considered to be low.

Liquefaction and lateral spreading tend to occur in loose, fine saturated sands and in places where the liquefied soils can move toward a free face (e.g. a cliff or ravine). The deeper soils underlying the project site are typically very dense, sandy soils and no ground water was encountered in the boring to a maximum explored depth of 20.0 feet. Considering the deeper dense sandy soils and the absence of shallow groundwater, the potential risk for occurrence of damaging liquefaction or lateral spreading is considered to be low during a strong seismic event.

Differential compaction and settlement occur generally in loose, granular or unconsolidated semi-cohesive soils during severe ground vibration. In our opinion, the risk for soil consolidation caused differential compaction and settlement during a major seismic event is considered to be low.

IX. UNFORESEEN OR UNUSUAL CONDITIONS:

If any unforseen or unsuitable soils conditions are found during grading or construction of the new canopy addition the Geotechnical engineer shall be notified immediately so that remedial action can be taken. Such unsuitable conditions could be:

1. Wet, loose/soft or unsuitable pockets of sandy soil within the proposed building site or foundation excavations.
2. Soil with a high organic content at the finished subgrade of the building pad or bottom of the foundation excavations.
3. Any other unforeseen conditions that would require remedial action by the Geotechnical engineer, project engineer, architect or contractor.

X. CONCLUSIONS AND RECOMMENDATIONS:

From our field observations, analysis of the test data, and knowledge of the general area soils, the following are concluded:

1. The project soil conditions are suitable for the proposed addition provided any loose near surface soil is recompacted prior to excavating for the new building foundations or finishing the subgrade of the building pads as recommended in Sections V and VII herein.

2. Design criteria for a spread footing foundation system for the project addition is provided in Sections IV and V. Design criteria for concrete slabs-on-grade are provided in Sections IV, V and VII herein.

3. Surface storm water runoff should be carefully controlled around the proposed addition to provide positive drainage away from building foundations as discussed in Section VI herein.

4. The Geotechnical engineer should review the building and site grading plans for compliance with the recommendations herein and may provide additional specific recommendations for surface or subsurface drainage. The Geotechnical engineer shall inspect and approve all new foundation excavations.

5. Grading and compaction specifications and specifications for new concrete floor slabs-on-grade are provided in Section VII herein.

6. Seismic considerations are discussed, and geoseismic design coefficients are provided in Section VIII herein per the 2016 CBC. The potential for damaging earthquake related liquefaction is considered to be low at the project site.

XI. LIMITATIONS:

This report necessarily assumes that the subsurface conditions are as found in the borings. It should be recognized that the soil conditions described in this report are based on five borings and our knowledge of the general area soils. It must be understood that subsurface soil conditions can vary between borings and from site to site. If any unusual soil conditions are found during grading, installation of underground utilities or building construction, the Geotechnical engineer should be notified immediately so that remedial action can be taken (see Section IX).

This report is issued with the understanding that it is the responsibility of the Owners or their representative to ensure that the applicable provisions of the recommendations contained herein are incorporated into the plans and specifications and that the necessary steps are taken to see that contractors and subcontractors carry

out such provisions in the field. The use of this report, its contents or any part thereof, by a party or its agents, other than Joby Aviation, their engineer, architect, contractor or designated agents, is hereby disallowed unless specific permission is given to do so by Soil Surveys Group, Inc. This investigation and report were prepared with the understanding that a new canopy tent addition will be constructed at the project site as shown on the Figure II map enclosed herein. The use of this report, boring logs and laboratory test data shall be restricted to the original use for which they were prepared and publication by any method, in whole or in part, is prohibited without the written consent of Soil Surveys Group, Inc. Title to the designs remains with Soil Surveys Group, Inc. without prejudice. Visual contact with this report and drawings constitutes prima facie evidence of the acceptance of these restrictions.

Soil Surveys Group, Inc. will not take responsibility for or assume any liability for the recommendations made in this report unless Soil Surveys Group, Inc. performs the field inspections and testing mentioned herein.

The findings and recommendations of this report are considered valid at the present date. However, changes in the property conditions can occur with the passage of time on this or adjacent properties, whether due to natural processes or the works of man. Therefore, the findings of this report shall be considered valid for a period of not more than three years without being reviewed and updated by Soil Surveys Group, Inc.

BASE: U.S. Geological Survey, Marina 7.5' Quadrangle

Marina, CA

FIGURE I: VICINITY MAP

SCALE
1" = 2000'

By: **Soil Surveys Group, Inc.**
103 Church Street
Salinas, CA 93901
831-757-2172

Job #7120

FIGURE II

Boring Locations (approx.)

N

NO SCALE

BASE: 3200 Imjin Road, in Marina, California
APN: 031-111-037
Site Image from Amy Gross, May 2019- Job #7120

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APPENDIX A

BORING LOGS

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

GRAIN SIZES

U.S STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

200	40	10	4	3/4"	3"	12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FT*
VERY LOOSE	0 - 4
LOOSE	4-10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH**	BLOWS/FT*
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D) split spoon (ASTM D-1586)

** *Unconfined compressive strength in tons/ft^2 as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation

FIGURE NO. KEY TO LOGS

EXPLORATION DRILL LOG

HOLE NO. B-1

PROJECT Joby Aviation, 3200 Imjin Road, Marina | Job #7120 | DATE 5/15/19 | LOGGED BY JG

DRILL RIG Exploration Geoservices B-53R | HOLE DIA. 8" | SAMPLER Terzaghi Split Spoon (SPT)

GROUNDWATER DEPTH: | INITIAL --- | FINAL --- | HOLE ELEV. ---

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (pcf)	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	POCKET PEN. (tsf)
4" Asphaltic concrete/ Light tan, silty, gravelley,	AC/SM								
fine to coarse grained SAND; slightly moist		1							
Reddish-yellow, fine to coarse grained SAND;	SP		SPT						
moist, medium dense		2							
			XXX	29	91.4	3.2	Non	Plastic	---
		3							
Light yellowish-tan, fine to coarse grained SAND;	SP		SPT						
moist, medium dense		4							
			XXX	23	107.3	4.0			---
		5							
Light yellowish-reddish-tan, fine to medium grained	SP		SPT						
SAND; moist, medium dense		6							
			XXX	28	113.0	5.2			---
		7							
		8							
Light tan, fine to medium grained SAND; moist,	SP	9	SPT						
medium dense									
		10	XXX	36	109.7	4.4			---
		11							
		12							
		13							
Light tan, fine to medium grained SAND; moist,	SP	14	SPT						
very dense									
		15	XXX	64	106.7	3.6			---
		16							
		17							
		18							
Light yellowish-tan, fine to medium grained SAND;	SP	19	SPT						
moist, very dense									
Bottom of the boring at 20'	SP	20	XXX	56	91.2	4.0			---

DEPTH 20'

SOIL SURVEYS GROUP, INC.

EXPLORATION DRILL LOG

HOLE NO. B-2

PROJECT Joby Aviation, 3200 Imjin Road, Marina | Job #7120 | DATE 5/15/19 | LOGGED BY JG

DRILL RIG Exploration Geoservices B-53R | HOLE DIA. 8" | SAMPLER Terzaghi Split Spoon (SPT)

GROUNDWATER DEPTH: | INITIAL --- | FINAL --- | HOLE ELEV. ---

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (pcf)	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	POCKET PEN. (tsf)
10" Concrete									
		1							
Light reddish-yellowish-tan, slightly silty, fine to	SM		SPT						
medium grained SAND; moist, dense		2							
			XXX	33	110.4	3.7			---
		3							
Light reddish-yellowish-tan, fine to medium grained	SP		SPT						
SAND; moist, medium dense		4							
			XXX	17	100.6	3.5	Non	Plastic	---
		5							
Reddish-yellowish-tan, silty, fine to coarse grained	SM		SPT						
SAND with trace clay; moist, medium dense		6							
			XXX	16	122.2	5.7			---
		7							
		8							
Light yellowish-reddish-tan, fine to coarse grained	SP	9	SPT						
SAND with scattered gravels and iron staining;									
moist, dense		10	XXX	32	112.4	3.9			---
		11							
		12							
		13							
Light tan with dark brown veins, fine to coarse	SP	14	SPT						
grained SAND; moist, very dense									
		15	XXX	78	114.9	3.6			---
		16							
		17							
		18							
Light tan, fine to coarse grained SAND; moist,	SP	19	SPT						
dense									
Bottom of the boring 20'	SP	20	XXX	46	102.9	3.5			---

DEPTH 20'

SOIL SURVEYS GROUP, INC.

EXPLORATION DRILL LOG

HOLE NO. B-3

PROJECT Joby Aviation, 3200 Imjin Road, Marina | Job #7120 | DATE 5/15/19 | LOGGED BY JG

DRILL RIG Exploration Geoservices B-53R | HOLE DIA. 8" | SAMPLER Terzaghi Split Spoon (SPT)

GROUNDWATER DEPTH: | INITIAL --- | FINAL --- | HOLE ELEV. ---

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (pcf)	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	POCKET PEN. (tsf)
10" Concrete									
		1							
Light and dark grey, silty, fine to medium grained	SM		SPT						
SAND; moist, dense (Fill)		2							
			XXX	46	106.4	6.8	Non	Plastic	---
		3							
Light grey, dark brown, light tan, layers of silty, fine	SM/SP		SPT						
to medium grained SAND and clean fine to medium		4							
grained SAND; moist, very dense (Fill)			XXX	64	112.4	7.8			---
		5							
Dark grey, light brown, light yellowish-tan, silty,	SM		SPT						
fine to medium grained SAND; moist, dense (Fill)		6							
			XXX	41	125.4	7.9	Non	Plastic	0.5
		7							
		8							
Reddish-yellowish-tan, fine to medium grained	SP	9	SPT						
SAND; moist, loose									
		10	XXX	8	105.1	5.3			---
		11							
		12							
		13							
Light yellowish-tan, fine to medium grained SAND;	SP	14	SPT						
moist, medium dense									
		15	XXX	29	111.0	4.2			---
		16							
		17							
		18							
Light yellowish-tan, fine to medium grained SAND;	SP	19	SPT						
moist, dense									
Bottom of the boring 20'	SP	20	XXX	48	105.9	3.5			---

DEPTH 20'

SOIL SURVEYS GROUP, INC.

EXPLORATION DRILL LOG

HOLE NO. B-4

PROJECT Joby Aviation, 3200 Imjin Road, Marina | Job #7120 | DATE 5/15/19 | LOGGED BY JG

DRILL RIG Exploration Geoservices B-53R | HOLE DIA. 8" | SAMPLER Terzaghi Split Spoon (SPT)

GROUNDWATER DEPTH: | INITIAL --- | FINAL --- | HOLE ELEV. ---

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (pcf)	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	POCKET PEN. (tsf)
10" Concrete									
		1							
Light grey, light tan, silty, fine to medium grained	SM		SPT						
SAND; moist, very dense (Fill)		2							
			XXX	60	97.2	7.8			---
		3							
Light grey, dark grey, light tan, dark brown, silty,	SM		SPT						
fine to medium grained SAND; moist, very dense		4							
(Fill)			XXX	74/11"	109.1	9.3	Non	Plastic	---
		5							
Light greyish-tan, light tan, silty, fine to medium	SM		SPT						
grained SAND; moist, very dense (Fill)		6							
			XXX	83	126.4	9.6			---
		7							
		8							
Dark reddish-brown, silty, fine to medium grained	SM	9	SPT						
SAND; moist, dense									
		10	XXX	45	112.1	6.1			---
		11							
		12							
		13							
Reddish-yellowish-tan, slightly silty, fine to	SM	14	SPT						
medium grained, weakly cemented SAND; moist,									
medium dense		15	XXX	23	115.9	5.9			0.5
		16							
		17							
		18							
Light reddish-yellowish-tan, fine to medium grained	SP	19	SPT						
SAND; moist, dense									
Bottom of the boring at 20'	SP	20	XXX	44	85.9	3.7			---

DEPTH 20'

SOIL SURVEYS GROUP, INC.

EXPLORATION DRILL LOG

HOLE NO. B-5

PROJECT Joby Aviation, 3200 Imjin Road, Marina Job #7120 DATE 5/15/19 LOGGED BY JG

DRILL RIG Exploration Geoservices B-53R HOLE DIA. 8" SAMPLER Terzaghi Split Spoon (SPT)

GROUNDWATER DEPTH: INITIAL --- FINAL --- HOLE ELEV. ---

DESCRIPTION	SOIL TYPE	DEPTH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (pcf)	WATER CONTENT %	LIQUID LIMIT	PLASTIC LIMIT	POCKET PEN. (tsf)
2-3" Asphaltic concrete/Dark brown, silty SAND;	AC/SM								
moist		1							
Light yellowish-reddish-tan, fine to medium grained	SP		SPT						
SAND; moist, medium dense		2							
			XXX	23	110.5	4.8	Non	Plastic	---
		3							
Light yellowish-reddish-tan, fine to medium grained	SP		SPT						
SAND; moist, dense		4							
			XXX	33	105.0	5.6			---
		5							
Light yellowish-reddish-tan, fine to medium grained	SP		SPT						
SAND; moist, dense		6							
			XXX	31	99.8	4.9			---
		7							
		8							
Light yellowish-reddish-tan, fine to medium grained	SP	9	SPT						
SAND; moist, medium dense									
		10	XXX	26	101.5	4.5			---
		11							
		12							
		13							
Light yellowish-tan, fine to medium grained SAND;	SP	14	SPT						
moist, dense									
		15	XXX	44	104.4	4.5			---
		16							
		17							
		18							
Light yellowish-tan, fine to medium grained SAND;	SP	19	SPT						
moist, dense									
Bottom of the boring at 20'	SP	20	XXX	42	103.3	6.0			---

DEPTH 20'

SOIL SURVEYS GROUP, INC.