PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION
RICHMOND ELEMENTARY SCHOOL RELOCATION PROJECT
RIDGECREST, CALIFORNIA

BSK PROJECT G20-078-11B

PREPARED FOR:
SIERRA SANDS UNIFIED SCHOOL DISTRICT
113 W. FELSPAR AVENUE
RIDGECREST, CALIFORNIA 93555

APRIL 28, 2020

PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION
RICHMOND ELEMENTARY SCHOOL RELOCATION PROJECT
RIDGECREST, CALIFORNIA

Prepared for:

Mr. Randy Coit
Sierra Sands Unified School District
113 W. Felspar Avenue
Ridgecrest, California 93555

Bakersfield Project: G20-078-11B

April 28, 2020

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1. INTRODUCTION

This report presents the results of a Preliminary Geotechnical Engineering Investigation conducted by BSK Associates (BSK), for the proposed Richmond Elementary School Relocation Project in Ridgecrest, California (Site). The Site is located in an open field enclosed by Richmond Blvd, Gateway Blvd, Ridgecrest Blvd, and Gold Canyon St in Ridgecrest, California, as shown on the Site Vicinity Map, Figure A-1. The geotechnical engineering investigation was conducted in accordance with BSK Proposal GB20-19846 dated March 31, 2020.

This report provides a description of the geotechnical conditions at the Site and provides our findings relative to the site soil, groundwater and seismic conditions.

1.1. Planned Construction

Based on the information provided, BSK understands that Richmond Elementary school will be relocated to a new location on the east side of Gateway Blvd midway between Gold Canyon St and Ridgecrest Blvd in Ridgecrest, California. The site for the new location is currently vacant, and consists of approximately 70 acres for the preliminary investigation. The preliminary geological and environmental hazards assessment for the Richmond Elementary School replacement project prepared by PlaceWorks has been reviewed by BSK to evaluate nearby seismic hazards.

1.2. Purpose and Scope of Services

The objective of this preliminary geotechnical investigation was to characterize the subsurface conditions at the proposed school site. The scope of the investigation included a field exploration, laboratory testing, and preparation of this report. Our scope of services did not include environmental site assessment, sampling, testing and analysis for hazardous materials. Additional geotechnical investigation will be required for continued development for the proposed school campus.

2. FIELD INVESTIGATION AND LABORATORY TESTING

2.1. Field Exploration

The field exploration for this investigation was conducted under the oversight of a BSK staff member. Three (3) borings were drilled at the Site on April 13, 2020 using a CME 95 rig provided by Baja Exploration to a maximum depth of 51.5 feet beneath the existing ground surface (bgs).

The soil materials encountered in the Borings were visually classified in the field, and the logs were recorded during the drilling and sampling operations. Visual classifications of the materials encountered in the borings were made in general accordance with the Unified Soil Classification System (ASTM D 2488). A soil classification chart is presented in Appendix A. Stratification lines were approximated by the field staff based on observations made at the time of drilling, while the actual boundaries between soil types may be gradual and soil conditions may vary at other locations.

2.2 Laboratory Testing

Laboratory tests were performed on selected soil samples to evaluate moisture content, dry density, shear strength, collapse potential, fines content, expansion index, and corrosion characteristics. A description of the laboratory test methods and results are presented in Appendix B.

3. SITE AND GEOLOGY/SEISMICITY CONDITIONS

The following sections address the Site descriptions and surface conditions, regional geology and seismic hazards, subsurface conditions, and groundwater conditions at the Site. This information is based on BSK's field exploration and published maps and reports.

3.1 Site Description and Surface Conditions

The Site is located at the open field enclosed by Richmond Blvd, Gateway Blvd, Ridgecrest Blvd, and Gold Canyon St in Ridgecrest, California. The surface of the site is currently dry silty sand with various native plants. The Site is located in the west half of the southwest quarter of Section 35, Township 26 South, and Range 40 East of the Mount Diablo Meridian. The NAD 83 GPS coordinates for the center of the Site are 35.6262 degrees North latitude and 117.6501 degrees West longitude.

3.2 Preliminary Regional Geology and Seismic Hazards Assessment

Our Scope of services included a review of published maps and reports to assess the regional geology and potential for seismic hazards.

3.2.1 Previous Geologic Hazards Assessment Report Review

BSK reviewed the following report: Draft Preliminary Geologic and Environmental Hazards Assessment, Richmond Elementary School Replacement Project, Sierra Sands Unified School District, Dated September 2019, prepared by Placeworks. The Placeworks report was prepared for preliminary site selection and to meet California Education Code and California Environmental Quality Act (CEQA) requirements. Our review was limited to the "Geology and Soils" portion of Placeworks report. The report identified three potential sites for selection consideration. The Site referenced in BSK's current report corresponds to Site #3 int eh Placeworks report.

Section 3.2 of the Placeworks identified potential active faults located on Sites #1 and #2. Our review of Placeworks Figure 8 – Site #3, places a "fault line" crossing the southeast corner of Site #3. There was no discussion of this fault in the report. Our experience with school site report that are performed by the California Geologic Survey (CGS), additional information would be required to address the mapped fault. Our review of USGS fault database indicates that the fault is a strand of the Little Lake fault zone and is considered active. Potential mitigation measures that may be required include avoidance of placing occupied structures in the southeast corner of the Site. This setback area may already be in place with the 500 foot Highway Buffer shown on Placeworks Figure 8.

3.2.2 Regional Geology

The site is located in Basin and Ranges Geomorphic Province. The Basin and Ranges is characterized by north-south trending block-faulted mountain ranges and intervening valleys. Broad alluvial fans have formed along the transition of the ranges and valleys. The southern portion of the Basin and Ranges transitions to the Mohave Desert Geomorphic Province near the Garlock Fault approximately 12 miles south of the Site. Approximately 12 miles west of the Site is the Sierra Nevada Geomorphic Province. South of the Site area is El Paso Mountain which consist of Mesozoic granitic rocks and Paleozoic marine rocks. Approximately three miles northeast of Site are The Lone Butte Hills consisting of Quaternary Volcanic rocks (Tuff).

The site is located in the Indian Wells Valley a basin with the El Paso Mountains to the south, the Sierra Nevada Ranges to the west and the Argus Range and Coso Mountains to the Northwest. The Indian Wells Valley is a topographic basin with infilling from surrounding alluvial fans. During wet periods of Pleistocene the area was submerged by the ancestral China Lake. During periods of the Pleistocene, China Lake joined into a series of massive lakes that included Owens Lake, China Lake, Searles Lake, Panamint Lake, and ultimately Manly Lake in Death Valley. Toward the end of the Pleistocene the lakes receded to isolated lakes that formed saline lakes and playas in the Holocene. The Holocene China Lake shoreline is estimated to have been at an elevation of approximately 2,180 feet (Giambastiani 2007).

Dibblee, 2008 identified the Site area as located on the contact of Older Lacustrine Deposits (Qol) and Alluvial gravel and sand (Qa).

3.2.3 Seismic Hazards Assessment

The types of geologic and seismic hazards assessed include surface ground fault rupture, liquefaction, seismically induced settlement, slope failure, flood hazards and inundation hazards.

The purpose of the Alquist-Priolo Geologic Hazards Zones Act, as summarized in CDMG Special Publication 42 (SP 42), is to "prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." As indicated by SP 42, "the State Geologist is required to delineate "earthquake fault zones" (EFZs) along known active faults in California. Cities and counties affected by the zones must regulate certain development 'projects' within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting.

The Site is not located in a Fault-Rupture Hazard Zone. The closest Fault-Rupture Hazard Zone is associated with the Little Lake fault zone, located approximately 3,500 feet southwest of the Site.

Zones of Required Investigation referred to as "Seismic Hazard Zones" (SHZ) in CCR Article 10, Section 3722, are areas shown on Seismic Hazard Zone Maps where site investigations are required to determine the need for mitigation of potential liquefaction and/or earthquake-induced landslide ground displacements. The site is within the Ridgecrest North 7.5 Minute Quadrangle and there are no mapped areas that have Seismic Hazard Zones in the project area.

The current and historical depth to groundwater was greater than 50 feet below the ground surface (bgs), therefore the potential for liquefaction is low.

The project area is essentially flat and the potential hazard due to landslides from adjacent properties is not applicable.

3.3 Subsurface Conditions

The subsurface material generally consisted of loose to clayey sand and clay with sand in the upper 3 feet. Underlain the material is medium dense to dense silty sand throughout the end of the boreholes. In Boring B-2, silty sand was found in the upper 5 feet with silt and clayey sand underlain to 25 feet bgs. From 25 feet bgs to the end of the borehole of B-2 is dense to very dense sand with silt.

The upper 5 feet of material is anticipated to have very low potential for expansion with an expansion index of 7 at Boring B-1.

Based on the results of the consolidation test, the on-site soils below 5 feet are considered to have a low potential for hydrocompaction.

The boring logs in Appendix A provide a more detailed description of the materials encountered, including the applicable Unified Soil Classification System symbols.

3.4 Groundwater Conditions

Groundwater was not encountered at the time of drilling on April 13, 2020. Based on the groundwater elevation data from the California Department of Water Resources (DWR), the historic high groundwater depth in the vicinity was recorded to be 63.5 feet bgs on August 21, 1972 from State Well 26S40E35Q002M, located approximately 0.5 miles southeast of the center of the site.

Please note that the groundwater level may fluctuate both seasonally and from year to year due to variations in rainfall, temperature, pumping from wells and possibly as the result of other factors such as irrigation, that were not evident at the time of our investigation.

4. CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the soil conditions would not preclude the construction of the proposed improvements. As previously noted, additional geotechnical investigation will be required for continued development for the proposed school campus.

4.1 Soil Corrosivity

A surface soil sample obtained from the Site was tested to provide a preliminary screening of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts. The test results are presented in Appendix B.

The corrosivity evaluation was performed by BSK on soil samples obtained at the time of drilling. The soil was evaluated for minimum resistivity (ASTM G57), pH (ASTM D4972), and soluble sulfate and chlorides (CT 417 and CT 422). At Boring B-1, the minimum resistivity was 620 ohm-cm, pH was 8.35, sulfate was detected at 100 parts per million (ppm), and chloride was detected at 50 ppm.

The water-soluble sulfate content severity class is considered not severe to concrete (Exposure Category S0 per Table 4.2.1 of ACI 318-11). Representative samples of the Site soil in the vicinity has a minimum resistivity of 620 ohm-cm which is considered very severely corrosive to buried metal conduit. Therefore, buried metal conduits, ferrous metal pipes, and exposed steel should have a protective coating in accordance with the manufacturer's specification.

5. LIMITATIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the Borings performed at the locations shown on the Boring Location Map, Figure A-2. The report does not reflect variations which may occur between or beyond the Borings. The nature and extent of such variations may not become evident until construction is initiated. If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-Site observations during the excavation period and noting the characteristics of the variations.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observation program during the construction phase. BSK assumes no responsibility for construction compliance with the design concepts or recommendations unless it has been retained to perform the testing and observation services during construction as described above.

The findings of this report are valid as of the present. However, changes in the conditions of the Site can occur with the passage of time, whether caused by natural processes or the work of man, on this property or adjacent property. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation, governmental policy or the broadening of knowledge.

BSK has prepared this report for the exclusive use of the Client and members of the project design team. The report has been prepared in accordance with generally accepted geotechnical engineering practices which existed in Kern County at the time the report was written. No other warranties either expressed or implied are made as to the professional advice provided under the terms of BSK's agreement with Client and included in this report.

6. REFERENCES

Department of Water Resources. http://www.water.ca.gov/waterdatalibrary/, Water Data Library, April 2020.

Dibblee, T.W., and Minch, J.A., 2008, Geologic map of the Inyokern & Ridgecrest 15 minute quadrangles, Kern & San Bernardino Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-410

Earth Point. http://earthpoint.us/townships.aspx, Public Land Survey System, Google Earth, 2016, April 2020.

Giambastiani, M.A., Bullard, T., 2007, Terminal Pleistocene-early Holocene Occupations on the Eastern Shoreline of China Lake, California, Pacific Coast Archaeological Society Quarterly, V43, No. 1-2

USGS/OSHPD, U.S. Seismic Design Maps, https://seismicmaps.org/. April 2020.

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

The field exploration for this investigation was conducted under the oversight of a BSK staff member. Three (3) borings were drilled at the Site on April 13, 2020 using a CME 95 rig provided by Baja Exploration to a maximum depth of 51.5 feet beneath the existing ground surface (bgs).

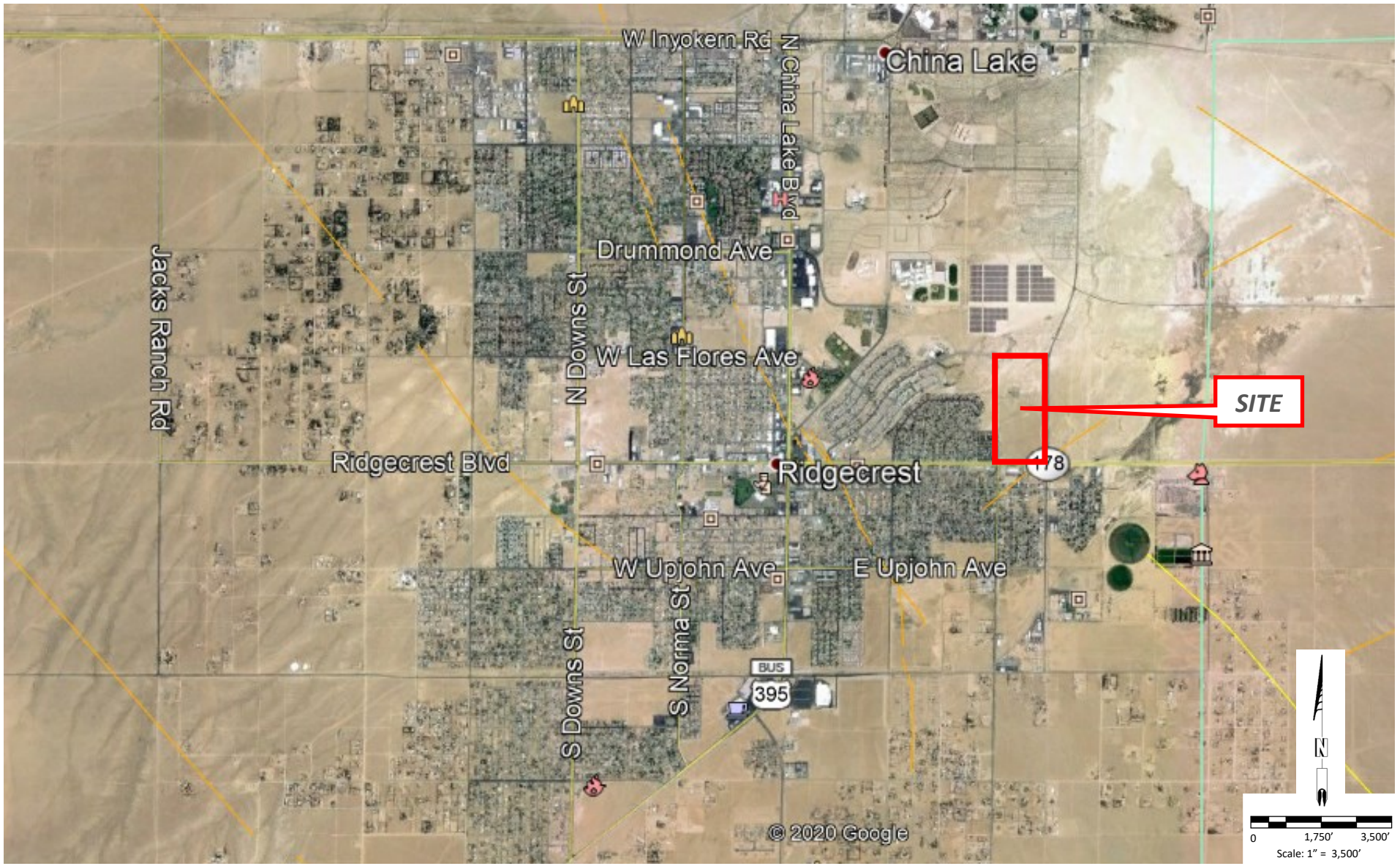
The soil materials encountered in the test borings were visually classified in the field, and the logs were recorded during the drilling and sampling operations. Visual classification of the materials encountered in the test borings was made in general accordance with the Unified Soil Classification System (ASTM D 2488). A soil classification chart is presented herein. Boring logs are presented herein and should be consulted for more details concerning subsurface conditions. Stratification lines were approximated by the field staff based on observations made at the time of drilling, while the actual boundaries between soil types may be gradual and soil conditions may vary at other locations.

Subsurface samples were obtained at the successive depths shown on the boring logs by driving samplers which consisted of a 2.5-inch inside diameter (I.D.) California Sampler and a 1.4-inch I.D. Standard Penetration Test (SPT) Sampler. The samplers were driven 18 inches using a 140-pound hammer dropped from a height of 30 inches by means of either an automatic hammer or a down-hole safety hammer. The number of blows required to drive the last 12 inches was recorded as the blow count (blows/foot) on the boring logs. The relatively undisturbed soil core samples were capped at both ends to preserve the samples at their natural moisture content. Soil samples were also obtained using the SPT Sampler lined with metal tubes or unlined in which case the samples were placed and sealed in polyethylene bags. At the completion of the field exploration, the test borings were backfilled with the excavated soil cuttings.

It should be noted that the use of terms such as “loose”, “medium dense”, “dense” or “very dense” to describe the consistency of a soil is based on sampler blow count and is not necessarily reflective of the in-place density or unit weight of the soils being sampled. The relationship between sampler blow count and consistency is provided in the following Tables A-1 and A-2 for coarse-grained (sandy and gravelly) soils and fine grained (silty and clayey) soils, respectively.

Table A-1: Consistency of Coarse-Grained Soil by Sampler Blow Count		
Consistency Descriptor	**SPT Blow Count (#Blows / Foot)**	**2.5" I.D. California Sampler Blow Count (#Blows / Foot)**
Very Loose	<4	<6
Loose	4 – 10	6 – 15
Medium Dense	10 – 30	15 – 45
Dense	30 – 50	45 – 80
Very Dense	>50	>80

Table A-2: Consistency of Fine-Grained Soil by Sampler Blow Count		
Consistency Descriptor	**SPT Blow Count (#Blows / Foot)**	**2.5" I.D. California Sampler Blow Count (#Blows / Foot)**
Very Soft	<2	<3
Soft	2 – 4	3 – 6
Medium Stiff	4 – 8	6 – 12
Stiff	8 – 15	12 – 24
Very Stiff	15 – 30	24 – 45
Hard	>30	>45



REFERENCE IMAGE: Google Earth 2020

APPROXIMATE LOCATION OF SITE

BSK ASSOCIATES
700 22nd Street
Bakersfield, California 93301
Tel. (661) 327-0671

SITE VICINITY MAP

Richmond Elementary School Relocation
Richmond Road
Ridgecrest, California

FIGURE A-1

JOB NO. G20-078-11B
DATE April 2020
DR. BY YX
CH. BY OML
SCALE AS SHOWN
SHEET NO. 1 OF 1 SHEETS

REFERENCE IMAGE: Google Earth 2020

LEGEND:

- APPROXIMATE BORING LOCATION B-1
- APPROXIMATE LOCATION OF PROJECT
- APPROXIMATE LOCATION OF PREFERRED SCHOOL LOCATION

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BORING LOCATION MAP

Richmond Elementary School Relocation
Richmond Road
Ridgecrest, California

FIGURE A-2

JOB NO. G20-078-10B
DATE April 2020
DR. BY YX
CH. BY OML
SCALE AS SHOWN

SHEET NO. 1 OF 1 SHEETS

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half >#200	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES
		GRAVELS WITH OVER 15% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half <#200 sieve	SILTS AND CLAYS LIQUID LIMIT 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 CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS , MICACEOUS OR DIATOMACIOUS 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

Note: Dual symbols are used to indicate borderline soil classifications.

	Pushed Shelby Tube	RV	R-Value
	Standard Penetration Test	SA	Sieve Analysis
	Modified California	SW	Swell Test
	Auger Cuttings	TC	Cyclic Triaxial
	Grab Sample	TX	Unconsolidated Undrained Triaxial
	Sample Attempt with No Recovery	TV	Torvane Shear
CA	Chemical Analysis	UC	Unconfined Compression
CN	Consolidation	(1.2)	(Shear Strength, ksf)
CP	Compaction	WA	Wash Analysis
DS	Direct Shear	(20)	(with % Passing No. 200 Sieve)
PM	Permeability		Water Level at Time of Drilling
PP	Pocket Penetrometer		Water Level after Drilling (with date measured)

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
Unified Soil Classification System

BSK ASSOCIATES

Figure A-3

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LOG OF BORING NO. B-01

Project Name: **Richmond Elementary School Relocation**
Project Number: **G20-078-11B**
Project Location: **Ridgecrest, California**
Logged by: **Y. Xu**
Checked by: **A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetrometer, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		Surface: dry silty sand.										
		CL: CLAY w/ SAND: pale brown, fine to medium grained sand, dry, with silt.										
					31			95	6			
		SM: SILTY SAND: yellowish brown, fine to medium grained, medium dense, dry, trace coarse grained sand. ...increase in silt.										
5					60			111	7			
		...dense, fine grained sand, trace mineralization. ...with clay.										
10					55			102	9			
		...dense, fine to medium grained sand, trace mineralization, no trace clay.										
15					40							
		...dense.										
		End of boring.										
20												
25												

Completion Depth:	16.5	**Drilling Equipment:**	CME 95
Date Started:	4/13/20	**Drilling Method:**	Hollow Stem Auger
Date Completed:	4/13/20	**Drive Weight:**	140 pounds
California Sampler:	2.4" inner diameter	**Hole Diameter:**	8 inches
SPT Sampler:	1.4" inner diameter	**Drop:**	30 inches
		Remarks:	Borings backfilled with cuttings

GEO_TARGET BORING LOGS.GPJ GEOTECHNICAL 08.GDT 4/27/20

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LOG OF BORING NO. B-02

Project Name: **Richmond Elementary School Relocation**
Project Number: **G20-078-11B**
Project Location: **Ridgecrest, California**
Logged by: **Y. Xu**
Checked by: **A. Terronez**

Depth, feet	Graphic Log	Surface El.: / Location: / MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetrometer, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		Surface: dry silty sand.										
		SM: SILTY SAND: yellowish brown, fine to coarse grained, slightly moist, poorly graded, subangular.										
					15, 50/ 6"			114	2			
		...dense, dry, trace roots. ...increase in silt, pale brown, decrease in coarse grained sand, no roots.										
5					31, 50/ 5"			107	11			
		...dense, fine grained sand, light yellowish brown.										
		ML: SILT: light yellowish brown, hard, dry, trace fine grained sand.										
10					66		18	98	6			
		SC: CLAYEY SAND: light brown, fine to coarse grained, dense, slightly moist, poorly graded, subangular. ...with silt, weakly cemented.										
15		...dense, cemented, trace fine grained gravel, subangular.			42							
20		**SM: SILTY SAND:** light yellowish brown, fine to coarse grained, dense, dry, poorly graded, trace fine gravel, subangular.			48		13		3			
25					40							

Completion Depth: 51.5
Date Started: 4/13/20
Date Completed: 4/13/20
California Sampler: 2.4" inner diameter
SPT Sampler: 1.4" inner diameter

Drilling Equipment: CME 95
Drilling Method: Hollow Stem Auger
Drive Weight: 140 pounds
Hole Diameter: 8 inches
Drop: 30 inches
Remarks: Borings backfilled with cuttings

GEO_TARGET BORING LOGS.GPJ GEOTECHNICAL 08.GDT 4/27/20

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LOG OF BORING NO. B-02

Project Name: **Richmond Elementary School Relocation**
Project Number: **G20-078-11B**
Project Location: **Ridgecrest, California**
Logged by: **Y. Xu**
Checked by: **A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetrometer, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		SP: POORLY-GRADED SAND w/ SILT: light yellowish brown, fine to coarse grained, dense, dense, dry, subangular.*(continued)*										
30		...dense, light brown.			46		11		2			
35		no recovery.			38							
40		...dense, pale brown.			35							
45		...dense, trace fine gravel, subangular.			37		6		1			
50		...very dense, increase in silt.			52		8		1			
		End of boring.										

Completion Depth: 51.5
Date Started: 4/13/20
Date Completed: 4/13/20
California Sampler: 2.4" inner diameter
SPT Sampler: 1.4" inner diameter

Drilling Equipment: CME 95
Drilling Method: Hollow Stem Auger
Drive Weight: 140 pounds
Hole Diameter: 8 inches
Drop: 30 inches
Remarks: Borings backfilled with cuttings

GEO_TARGET BORING LOGS.GPJ GEOTECHNICAL 08.GDT 4/27/20

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LOG OF BORING NO. B-03

Project Name: **Richmond Elementary School Relocation**
Project Number: **G20-078-11B**
Project Location: **Ridgecrest, California**
Logged by: **Y. Xu**
Checked by: **A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetrometer, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		Surface: dry silty sand.										
		SC: CLAYEY SAND: light brown, fine to coarse grained, moist, with silt.										
					46			119	3			
		SM: SILTY SAND: yellowish brown, fine to coarse grained, dense, dry.										
5					32, 50/ 5"			80	4			
		...very dense, increase in silt, decrease in fine grained sand. ...increase in silt, fine to medium grained sand.										
10					36, 50/ 4"			115	4			
		...very dense, fine to coarse grained sand, trace fine grained gravel, subangular, weakly cemented, with clay.										
15					24							
		...medium dense, decrease in fines.										
		End of boring.										
20												
25												

Completion Depth: 16.5
Date Started: 4/13/20
Date Completed: 4/13/20
California Sampler: 2.4" inner diameter
SPT Sampler: 1.4" inner diameter

Drilling Equipment: CME 95
Drilling Method: Hollow Stem Auger
Drive Weight: 140 pounds
Hole Diameter: 8 inches
Drop: 30 inches
Remarks: Borings backfilled with cuttings

GEO_TARGET BORING LOGS.GPJ GEOTECHNICAL 08.GDT 4/27/20

APPENDIX B

LABORATORY TESTING RESULTS

APPENDIX B
LABORATORY TESTING

Moisture-Density Tests

The field moisture content, as a percentage of dry weight of the soils, was determined by weighing the samples before and after oven drying in accordance with ASTM D 2216 test procedures. Test results are presented on the boring logs in Appendix A.

Direct Shear Test

One (1) Direct Shear Test was performed on in-situ soil samples from selected Borings. The test was conducted to determine the soil strength characteristics. The standard test method is ASTM D 3080, Direct Shear Test for Soil under Consolidated Drained Conditions. The results of the direct shear test is presented graphically on Figure B-1.

Collapse Potential Test

Two (2) Collapse Potential Tests were performed on relatively undisturbed soil samples to evaluate collapse potential characteristics. The tests were performed in general accordance with ASTM D 5333. The sample was initially loaded under as-received moisture content to a selected stress level, loaded to a maximum load of 1300 psf and then saturated. The test results are presented on Figures B-2 and B-3.

Expansion Index Test

One (1) Expansion Index Test was performed on bulk soil samples in the Site area. The test was performed in general accordance with UBC Standard 18-2. The test results are presented on Figure B-4.

Soil Corrosivity

One (1) Corrosivity Evaluation was performed on bulk soil samples obtained at the time of drilling in the area of planned construction. The soil was evaluated for minimum resistivity (ASTM G57). The test results are presented in Table B-1.

Minus #200 Wash Tests

Five (5) #200 Wash Tests were performed on selected soil samples obtained at the time of drilling in the area of planned construction. The tests were performed to determine the amount of fine material present in the subsurface material. The tests were performed in general accordance with ASTM Test Method D1140. The test results are presented in Table B-2 and the boring logs in Appendix A.

Table B-1: Summary of Corrosion Test Results				
Sample Location	**pH**	**Sulfate, ppm**	**Chloride, ppm**	**Minimum Resistivity, ohm-cm**
B-1 @ 0-5 feet bgs	8.35	100	50	620

Table B-2: Summary of Minus #200 Wash Test Results	
Test Location	**Percent Fines**
B-2 @ 11-11.5 feet bgs	18
B-2 @ 20-21.5 feet bgs	13
B-2 @ 30-31.5 feet bgs	11
B-2 @ 45-46.5 feet bgs	6
B-2 @ 50-51.5 feet bgs	8

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Direct Shear Test

ASTM D 3080

Project Name:	Richmond Elementary School Relocation	**Sample Date:**	4/13/2020
Project Number:	G20-078-11B	**Test Date:**	4/20/2020
Lab Tracking ID:	B20-058	**Report Date:**	4/25/2020
Sample Location:	B-2 @ 3-3.5 feet bgs	**Sampled By:**	Y. Xu
Sample Description:	SM: SILTY SAND; yellowish brown; fine to Coarse; dry.	**Tested By:**	A. Bercerra

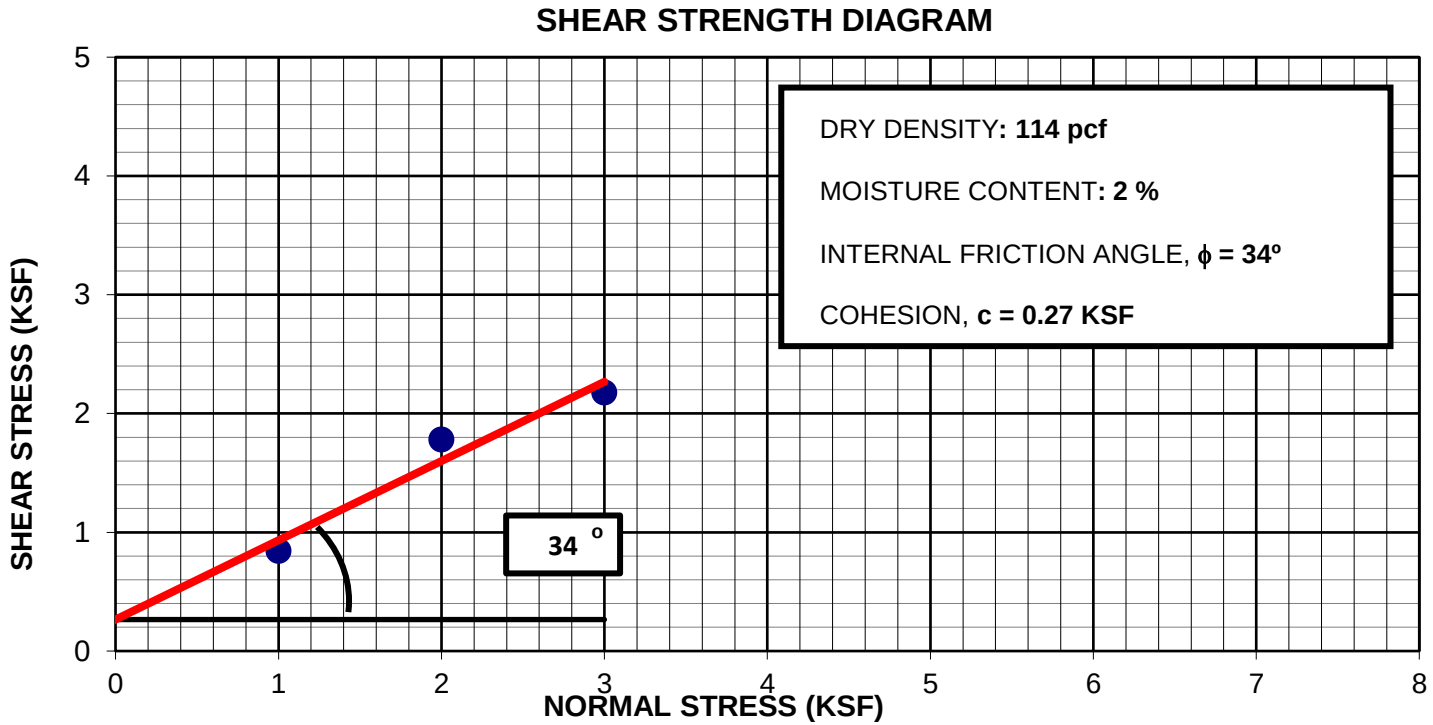

Figure B-1

Reviewed By: *Ian Remotigue*

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Collapse Potential Test

ASTM D 5333, One-Dimensional Analysis

Project Name:	Richmond Elementary School	**Sample Date:**	4/13/2020
Project Number:	G20-078-11B	**Test Date:**	4/20/2020
Sample Location:	B-1 @ 3.0-3.5 feet bgs	**Sampled By:**	Y. Xu
Sample Description:	SM: SILTY SAND: yellowish brown, fine to coarse grained, dry.	**Tested By:**	A. Becerra
Collapse Potential:	0.52 percent collapse at 1300 psf	**Dry Density (pcf):**	95
Peak Load (psf):	1300	**Initial Moisture Content (%):**	6

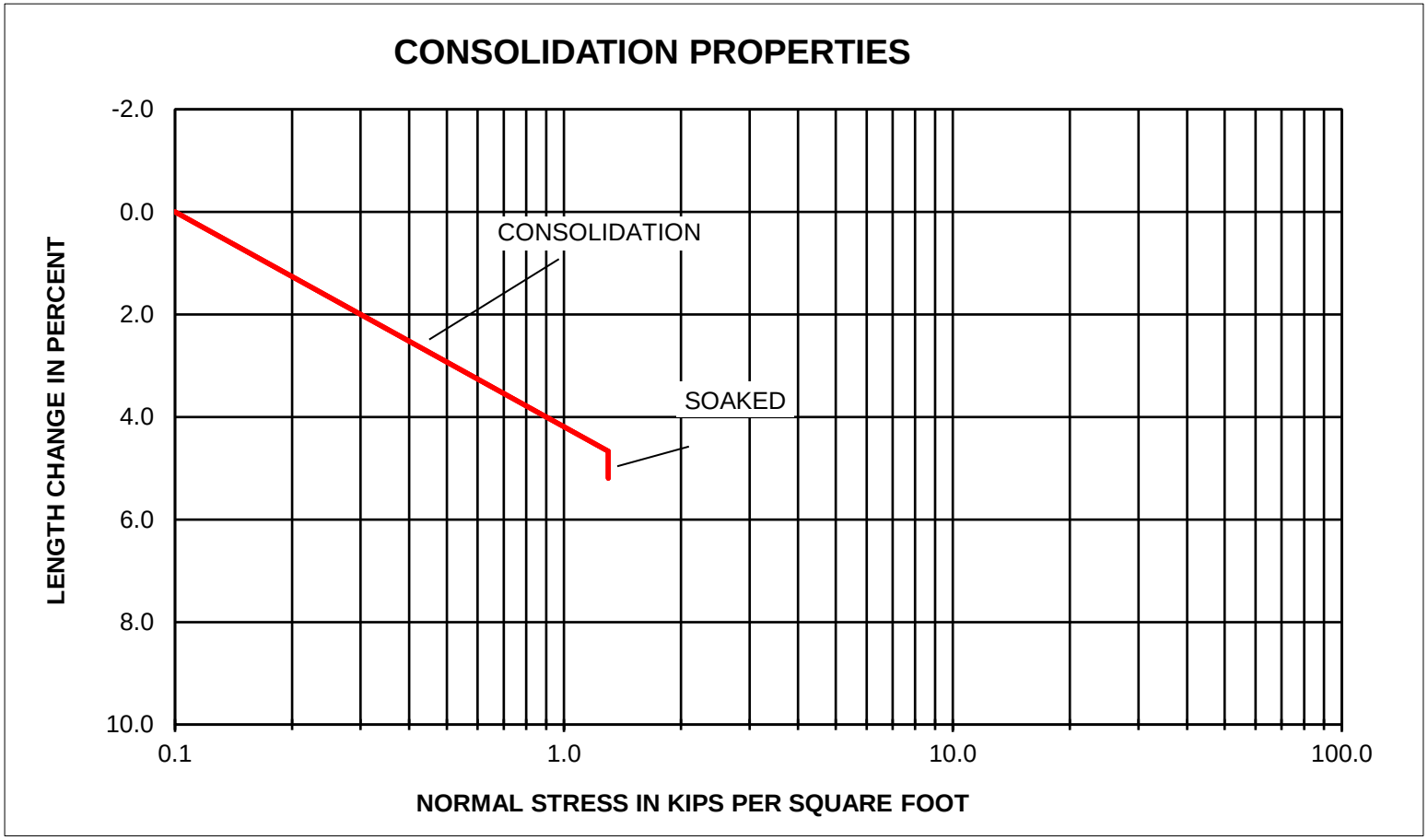

Figure B-2

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Collapse Potential Test

ASTM D 5333, One-Dimensional Analysis

Project Name:	Richmond Elementary School	**Sample Date:**	4/13/2020
Project Number:	G20-078-11B	**Test Date:**	4/20/2020
Sample Location:	B-1 @ 6.0-6.5 feet bgs	**Sampled By:**	Y. Xu
Sample Description:	SM: SILTY SAND w/ CLAY: yellowish brown, fine grained, dry.	**Tested By:**	A. Becerra
Collapse Potential:	-0.22 percent collapse at 1300 psf	**Dry Density (pcf):**	111
Peak Load (psf):	1300	**Initial Moisture Content (%):**	7

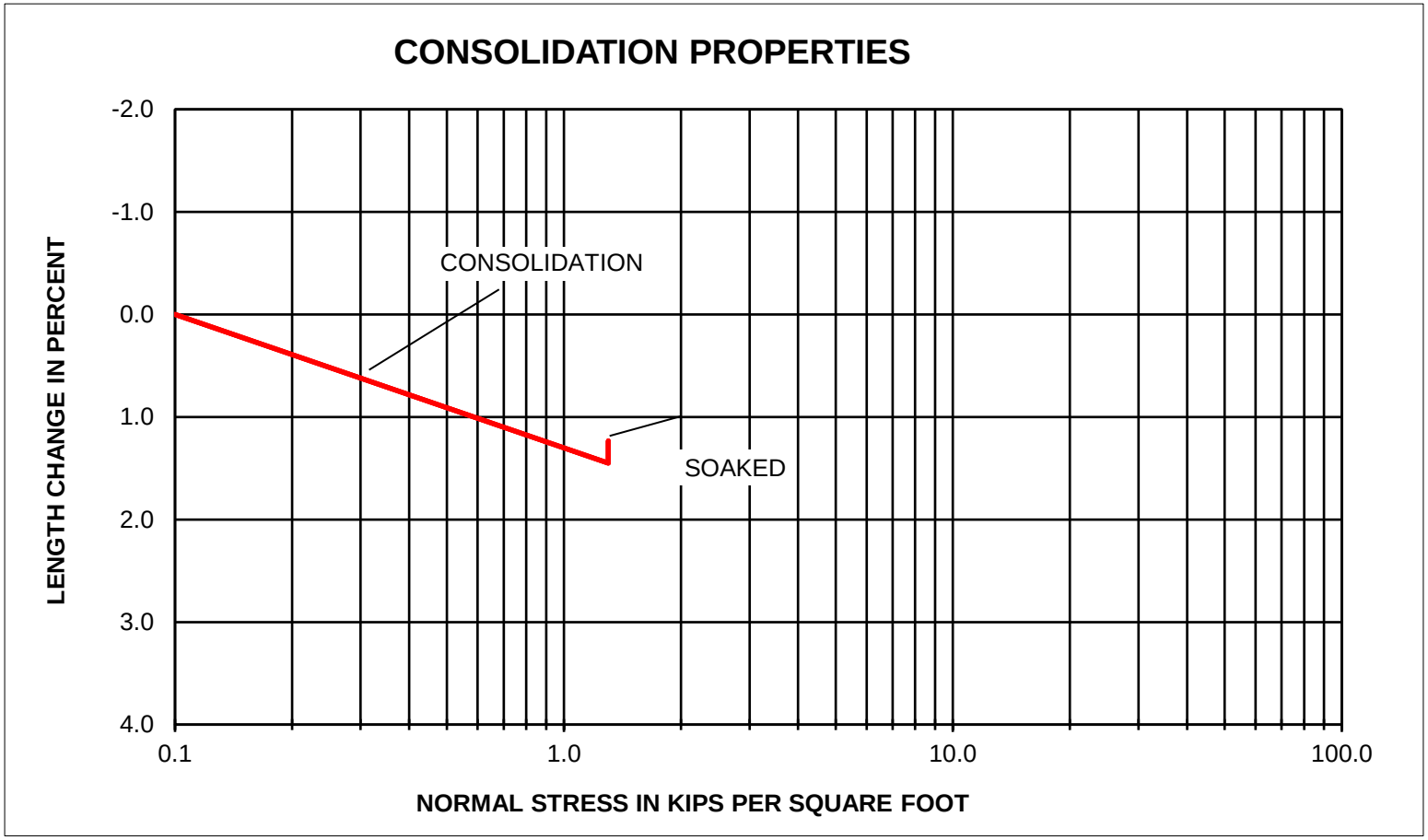

Figure B-3

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EXPANSION INDEX OF SOILS

ASTM D 4829 / UBC STANDARD 18-2

Project Name: Richmond Elementary School Relocation
Project Number: G20-078-11B
Sample Date: 4/13/2020
Lab Tracking ID: B20-058
Test Date: 4/23/2020
Sample Location: B-1 @ 0.0-5.0 feet bgs
Sample Description: SM: SILTY SAND: light brown, fine to medium grained, moist, trace clay.
Sampled By: Y. Xu **Tested By:** I. Remotigue **Reviewed By:** I.L.T.Remotigue

TEST DATA

INITIAL SET-UP DATA		**FINAL TAKE-DOWN DATA**	
Sample + Tare Weight (g)	759.9	Sample + Tare Weight (g)	789.5
Tare Weight (g)	366.5	Tare Weight (g)	366.5
Moisture Content Data		**Moisture Content Data**	
Wet Weight + Tare	150.0	Wet Weight + Tare	789.5
Dry Weight + Tare	135.3	Dry Weight + Tare	717.9
Tare Weight (g)	0	Tare Weight (g)	366.5
Moisture Content (%)	10.9%	Moisture Content (%)	20.4%
Initial Volume (ft^3)	0.007272	Final Volume (ft^3)	0.007318
Remolded Wet Density (pcf)	119.3	Final Wet Density (pcf)	127.4
Remolded Dry Density (pcf)	107.6	Final Dry Density (pcf)	105.9
Degree of Saturation	**51.8**	**Degree of Saturation**	**93**

EXPANSION READINGS

Initial Gauge Reading (in)	0.2489
Final Gauge Reading (in)	0.2552
Expansion (in)	0.0063

Uncorrected Expansion Index	**6**
Corrected Expansion Index, EI	**7**

Classification of Expansive Soil

EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

Remarks: The Material has a Very Low Potential Expansion

Figure B-4

APPENDIX C

PLACEWORKS PRELIMINARY GEOLOGIC AND ENVIRONMENTAL HAZARD

ASSESSMENT, SEPTEMBER 2019

September 2019 | Preliminary Geologic and Environmental Hazards Assessment

RICHMOND ELEMENTARY SCHOOL REPLACEMENT PROJECT

Sierra Sands Unified School District

Prepared for:

Sierra Sands Unified School District
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PLACEWORKS

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LIST OF FIGURES

Abbreviations and Acronyms

AICUZ	Air Installations Compatible Use Zones
CCR	California Code of Regulations
CDE	California Department of Education
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
DOD	Department of Defense
DSA	Department of the State Architect
DTSC	Department of Substances Control
Ed. Code	Code of Education
FIRM	Flood Insurance Map
IWVWD	Indian Wells Valley Water District
kV	kilovolt
NAWS	Naval Air Weapons Station
PRC	Public Resources Code
SCE	Southern California Edison

Abbreviations and Acronyms

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1. Introduction

1.1 INTRODUCTION

This study provides a preliminary assessment and supporting documentation of a selected list of state school facility standards applicable to state-funded new school site approvals. Sierra Sands Unified School District (the District) is researching three new sites and the existing Richmond Elementary School campus to determine the best location for the replacement of Richmond Elementary School, which is located inside the Naval Air Weapons Station (NAWS) China Lake military base in Kern County, California. The intent of this preliminary review is to assist the District in selecting a preferred site among the four under consideration.

California's standards for school site selection are found in Title 5 of the California Code of Regulations (CCR) Section 14010. Additional codes and regulations applicable to school facilities are in the Education, Government, and Public Resources Codes. In addition to the standards addressed herein, other health and safety requirements are under the purview of the Department of Toxic Substances Control (DTSC). Also, the California Environmental Quality Act (CEQA) requires lead agencies to address the environmental impacts of a project on the environment. These are separate and distinct from the issues addressed in this study, which deal with a site's ability to provide a safe and healthy environment for school use. Documentation of the project's environmental impacts under CEQA and the health and safety evaluation per DTSC are provided under separate cover.

1.2 PROJECT LOCATION

The existing Richmond Elementary School campus at 1206 Kearsarge Avenue inside NAWS China Lake in the city of Ridgecrest, Kern County, California. This and three other sites are being evaluated for their suitability for the elementary school. Site #1 is the Vieweg Adult Education campus at 348 Rowe Street inside NAWS China Lake. Site #2 is between Site #1 and the Murray Middle School campus on Knox Road. Site #3 is at the southwest corner of Richmond Road and North Gold Canyon Street in Ridgecrest, within NAWS China Lake but outside the secured part of the base. Figure 1, *Regional Location,* Figure 2, *Local Vicinity,* and Figure 3, *Aerial Photograph*, show the project site from regional, local, and aerial perspectives.

1.3 PROJECT DESCRIPTION

The proposed project is the replacement of the existing Richmond Elementary School campus to one of the three proposed sites, or reconstruction on the existing site. The District would lease the project site from the US Department of Defense (DOD), no matter which of the four sites is chosen for the reconstruction of Richmond Elementary School.

1. Introduction

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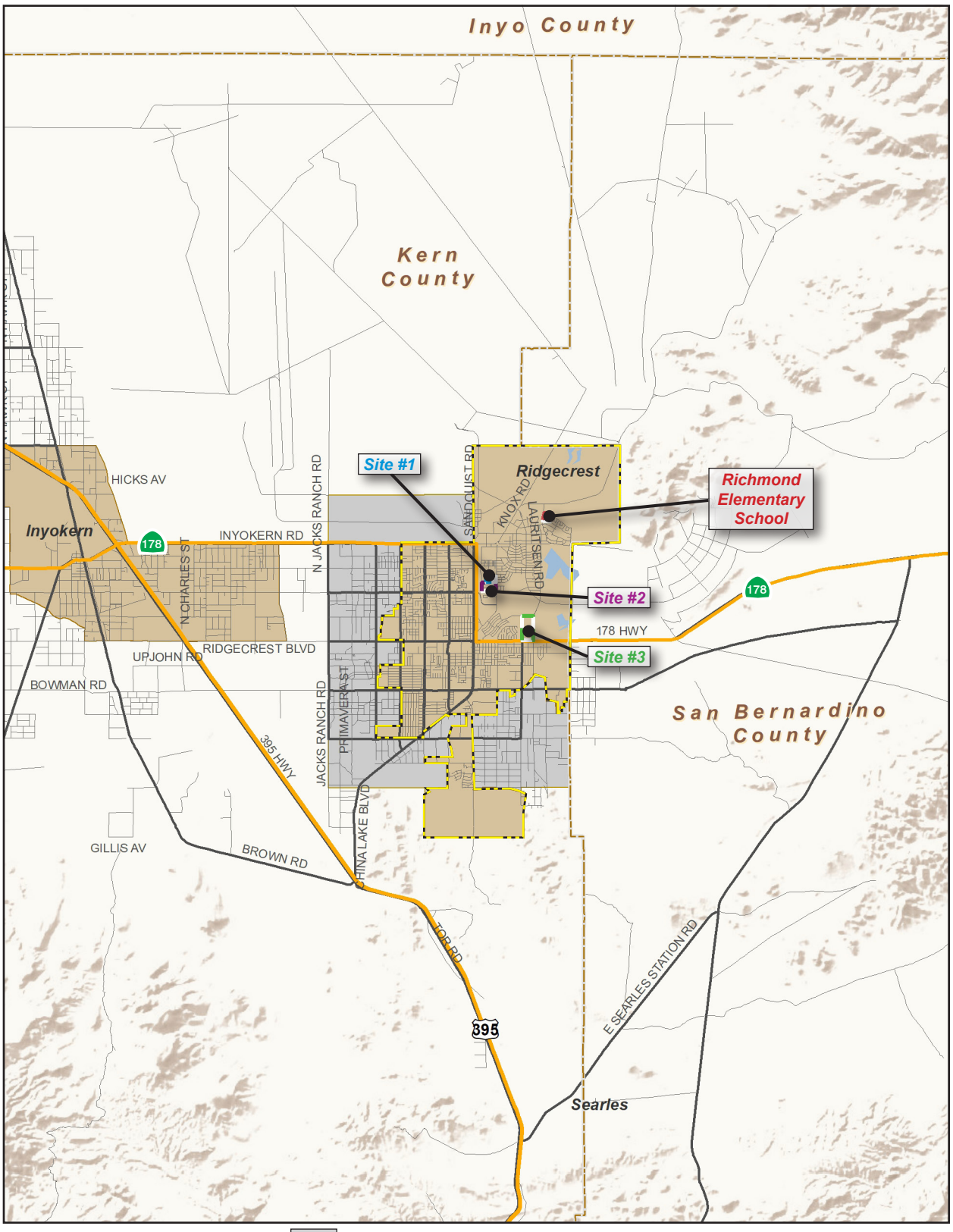
Figure 1 - Regional Location



Source: ESRI, 2019

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1. Introduction

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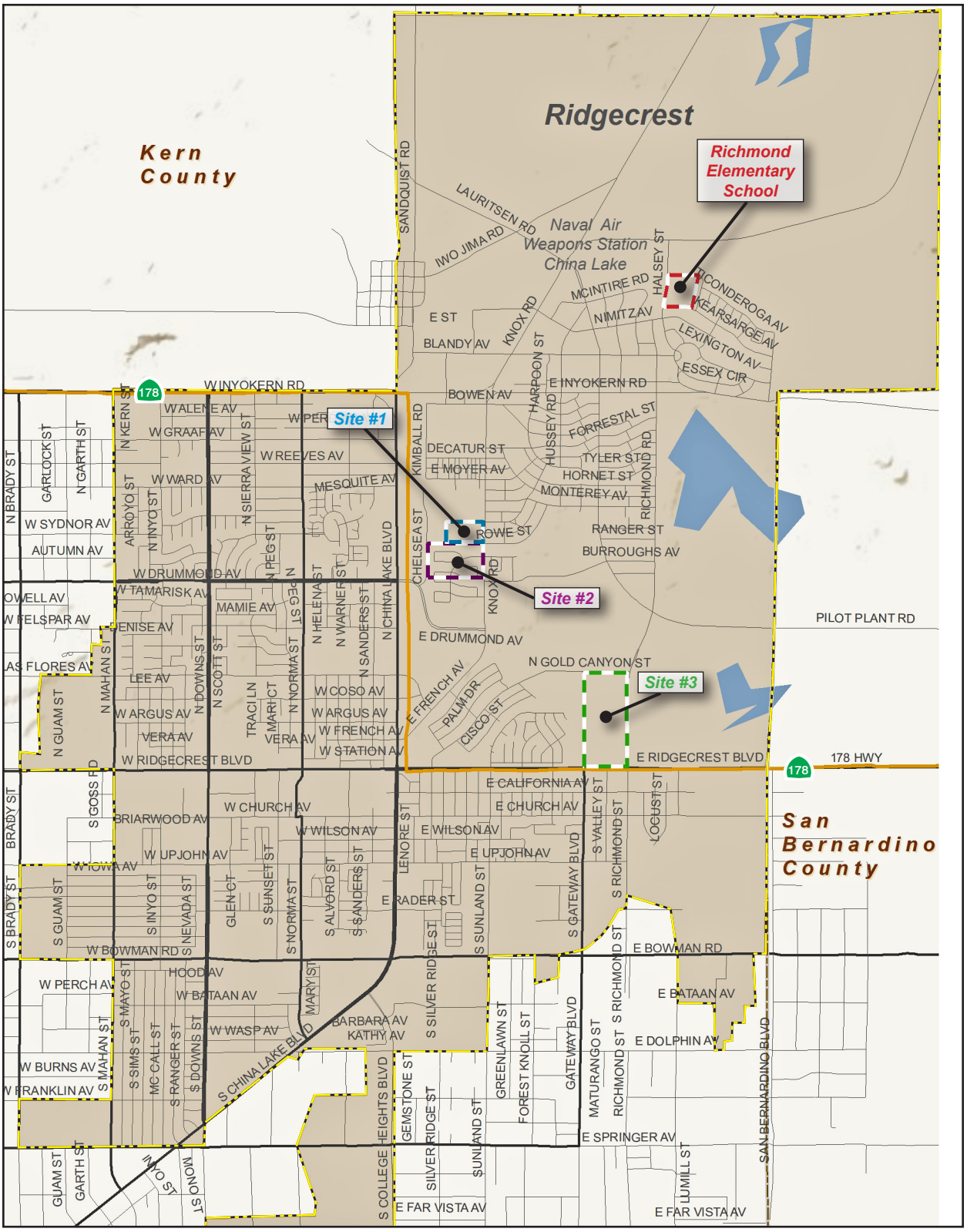
Figure 2 - Local Vicinity



City Boundary

State Route

Source: ESRI, 2019

0 1
Scale (Miles)

PlaceWorks

1. Introduction

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Figure 3 - Aerial Photograph

0 1,800
Scale (Feet)

Source: ESRI, 2019

1. Introduction

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2. State Standards for School Facilities

The State of California's standards for school site selection are found in 5 CCR Section 14010, and additional codes and regulations applicable to school facilities are found in the Education, Government and Public Resources Codes. The following table is a checklist of questions and code citations related to state-funded new school site and new construction approvals. This list is abbreviated for the purpose of this preliminary investigation. Once a preferred site is selected, a complete geological and environmental hazards assessment will be prepared for that site.

ABBREVIATED STATE STANDARDS CHECKLIST FOR STATE-FUNDED SCHOOL FACILITIES – SCHOOL SITE APPROVAL
(Documentation for SFPD 4.0, 4.01–4.03, School Site Approval)

Topic	Code References
Air Quality	
Is the boundary of the proposed school site within 500 feet of the edge of the closest traffic lane of a freeway or busy traffic corridor? If yes, would the project create an air quality health risk due to the placement of the school?	Ed. Code § 17213(c)(2)(C); CCR Title 5 § 14010(q)
Would the project create an air quality hazard due to the placement of a school within one-quarter mile of: (a) permitted and non-permitted facilities identified by the jurisdictional air quality control board or air pollution control district; (b) freeways and other busy traffic corridors; (c) large agricultural operations; and/or (d) a rail yard, which might reasonably be anticipated to emit hazardous air emissions, or handle hazardous or acutely hazardous material, substances, or waste?	Ed. Code § 17213(b); CCR Title 5 § 14010(q)
Geology and Soils	
Does the site contain an active earthquake fault or fault trace, or is the site located within the boundaries of any special studies zone or within an area designated as geologically hazardous in the safety element of the local general plan?	Ed. Code, §§ 17212 and 17212.5; CCR Title 5 § 14010(f)
Would the project involve the construction, reconstruction, or relocation of any school building on the trace of a geological fault along which surface rupture can reasonably be expected to occur within the life of the school building?	Ed. Code § 17212.5
Would the project involve the construction, reconstruction, or relocation of any school building on a site subject to moderate-to-high liquefaction, landslides, or expansive soils?	CCR, Title 5 § 14010(i) School Site Selection and Approval Guide, Appendix H
Hazards and Hazardous Materials	
Does the proposed school site contain one or more pipelines, situated underground or aboveground, which carry hazardous substances, acutely hazardous materials, or hazardous wastes, unless the pipeline is a natural gas line that is used only to supply natural gas to that school or neighborhood?	Ed. Code § 17213(a)(3)
Is the proposed school site located near an aboveground water or fuel storage tank or within 1,500 feet of an easement of an aboveground or underground pipeline that can pose a safety hazard to the site?	CCR, Title 5 § 14010 (h)
Is the school site in an area designated in a city, county, or city and county general plan for agricultural use and zoned for agricultural production, and if so, do neighboring agricultural uses have the potential to result in any public health and safety issues that may affect the pupils and employees at the school site? *(Does not apply to school sites approved by CDE prior to January 1, 1997.)*	Ed. Code § 17215.5

2. Environmental Checklist

ABBREVIATED STATE STANDARDS CHECKLIST FOR STATE-FUNDED SCHOOL FACILITIES – SCHOOL SITE APPROVAL
(Documentation for SFPD 4.0, 4.01–4.03, School Site Approval)

Topic	Code References
Is the property line of the proposed school site less than the following distances from the edge of respective power line easements: (1) 100 feet of a 50–133 kV line; (2) 150 feet of a 220–230 kV line; or (3) 350 feet of a 500–550 kV line?	CCR, Title 5 § 14010 (c)
Does the project site contain a current or former hazardous waste disposal site or solid waste disposal site and, if so, have the wastes been removed?	Ed. Code § 17213(a)(1)
Is the project site a hazardous substance release site identified by the state Department of Health Services in a current list adopted pursuant to § 25356 for removal or remedial action pursuant to Chapter 6.8 of Division 20 of the Health and Safety Code?	PRC § 21151.8 (a)(1)(B); Ed. Code § 17213(a)(2)
If prepared, has the risk assessment been performed with a focus on children's health posed by a hazardous materials release or threatened release, or the presence of naturally occurring hazardous materials on the school site?	Ed. Code § 17210.1(a)(3)
If a response action is necessary and proposed as part of this project, has it been developed to be protective of children's health, with an ample margin of safety?	Ed. Code § 17210.1(a)(4)
Is the proposed school site situated within 2,000 feet of a significant disposal of hazardous waste?	CCR, Title 5 § 14010 (t)
Is the site within 300 feet of an active oil or natural gas well?	Fire Code § 3406.3.1
Hydrology and Flooding	
Is the project site subject to flooding or dam/tank inundation or street flooding?	Ed. Code §§ 17212 and 17212.5 CCR, Title 5 § 14010 (g) School Site Selection and Approval Guide, Appendix H
Land Use and Planning	
Would the proposed school conflict with any existing or proposed land uses, such that a potential health or safety risk to students would be created?	Ed. Code § 17213 Gov't. Code § 65402 CCR, Title 5 § 14010 (m)
Is the site within a designated Farmland Security Zone?	Government Code § 51296.5
Transportation/Traffic	
Is the site easily accessible from arterials and is the minimum peripheral visibility maintained for driveways per Caltrans' Highway Design Manual?	CCR, Title 5 § 14010 (k)
Is the proposed school site within 1,500 feet of a railroad track easement?	CCR, Title 5 § 14010 (d)
Is the proposed school site within two nautical miles, measured by air line, of that point on an airport runway or potential runway included in an airport master plan that is nearest to the site? *(Does not apply to school sites acquired prior to January 1, 1966.)*	Ed. Code §§ 17215 (a)&(b)

Note: Any documentation related to the California Environmental Quality Act is provided under separate cover.
This checklist is also applicable to property additions to existing school sites.

3. Environmental Analysis

Section 2 provided a checklist of the State of California's health and safety standards for new school site approval and new school construction. This section evaluates the sites based on the applicable standards and provides mitigation measures where appropriate. The analyses are identified as "No Significant Hazard" where no hazard would occur or the hazard would not rise above existing standards and thresholds. The term "Potentially Significant Hazard" is used where the hazard exceeds established requirements.

The intent is to identify the major environmental and health and safety constraints that may affect the suitability of these sites. Even a preliminary review of sites may identify "red flags" that will suggest a site be excluded from further consideration.

Figure 4 identifies the four sites under consideration. The figure also shows a number of environmental constraints, including: 1) 100-year/500-year flood zones; 2) natural gas pipelines; 3) geologic faults; 4) high pressure/hazardous pipelines; 5) electrical transmission lines; 6) airport operations; and 7) high-volume highways. The various parallel lines and hatch marks around these features are "study zones" along highlighted infrastructure. Development within these zones is not prohibited; however, technical risk assessments may be required to definitively determine if the property would be adversely affected. The matrix above identifies the size of the study zones, such as 1,500 feet along high-pressure/hazardous gas lines.

Figures 5 through 8 show the four sites in greater detail.

3.1 AIR QUALITY

3.1.1 Is the boundary of the proposed school site within 500 feet of the edge of the closest traffic lane of a freeway or busy traffic corridor? If yes, would the project create an air quality health risk due to the placement of the school?

No Significant Hazard. There are no freeways or busy traffic corridors within 500 feet of any of the four sites being analyzed for this study (Kern Council of Governments 2019).[1]

[1] A freeway or busy traffic corridor is defined as "Roadways with an average daily traffic in excess of 50,000 vehicles in a rural area and 100,000 daily vehicles in an urban area" (Education Code Section 17213(d)(9); Public Resources Code Section 21151.8(b)(9)).

3.1.2 Would the project create an air quality hazard due to the placement of a school within one-quarter mile of: (a) permitted and non-permitted facilities identified by the jurisdictional air quality control board or air pollution control district; (b) freeways and other busy traffic corridors; (c) large agricultural operations; and/or (d) a rail yard, which might reasonably be anticipated to emit hazardous air emissions, or handle hazardous or acutely hazardous material, substances, or waste?

Potentially Significant Hazard for Sites #2 and #3. The Eastern Kern Air Pollution Control District recorded the NAWS China Lake as being a permitted facility. Therefore, all four sites are within a quarter mile of a permitted facility. However, only Sites #2 and #3 are within a quarter mile of a permitted source that has the potential to emit toxic air contaminants. Site #2 is within a quarter mile of Burroughs High School, which operates an emergency diesel generator that powers a firewater pump. Site #3 is within a quarter mile of a gasoline station at the southwest corner of Ridgecrest Boulevard and Gateway Boulevard. No nonpermitted sources were identified within a quarter mile of the site. There are no rail yards or agricultural uses nearby, and the four sites are not within a quarter mile of a freeway or busy traffic corridor (see 3.1.1). A Health Risk Assessment would be recommended for Sites #2 and #3.

3.2 GEOLOGY AND SOILS

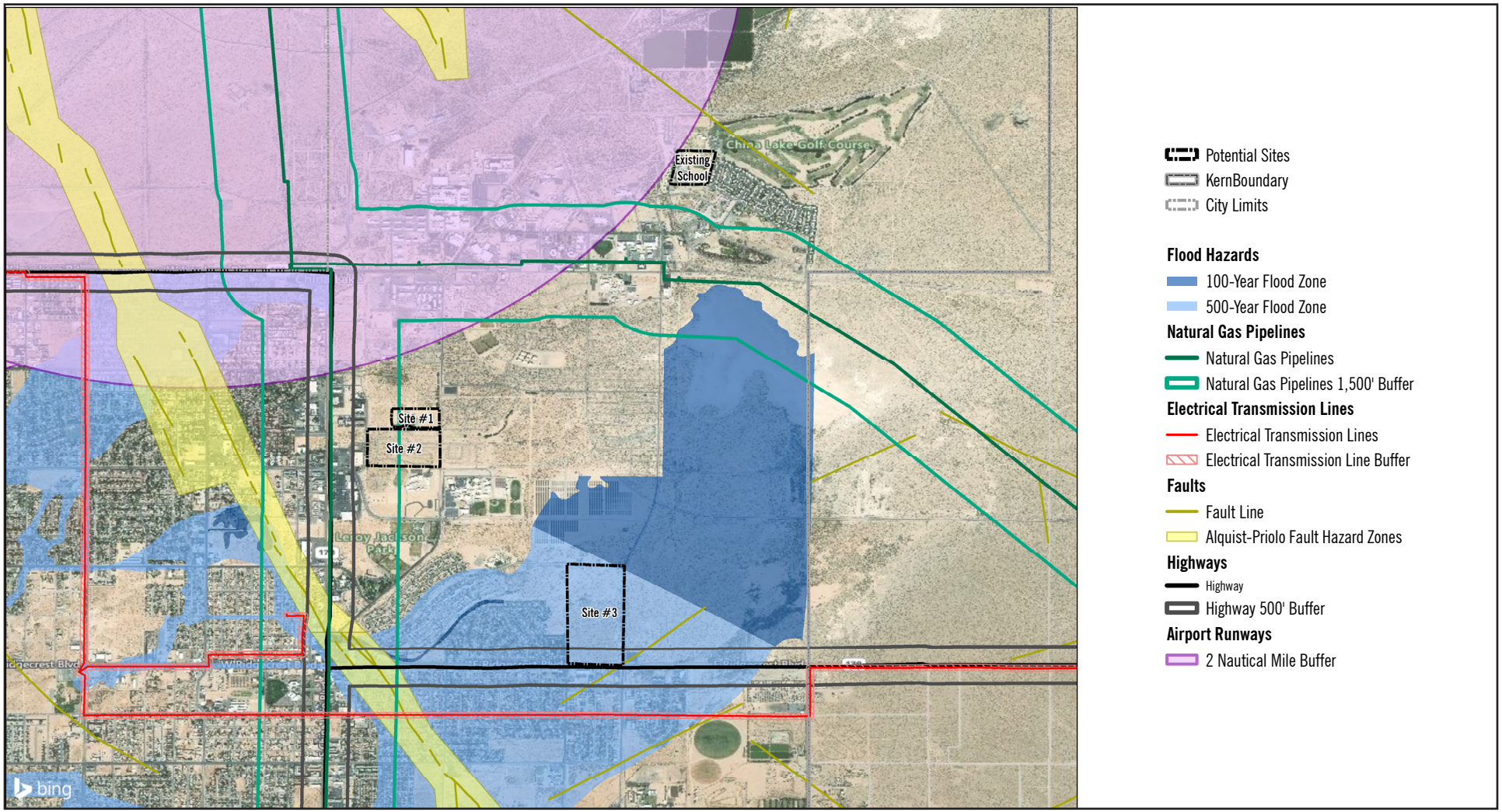
3.2.1 Does the site contain an active earthquake fault or fault trace, or is the site located within the boundaries of any special studies zone or within an area designated as geologically hazardous in the safety element of the local general plan?

Potentially Significant Hazard for Sites #1 and #2. There may be an active fault on Sites #1 and #2. BSK Associates (2012) was hired by the District to perform a fault investigation for Murray Middle School, which was required as a condition of use of that site by DOD. From August 13 to August 24, 2012, a 1,515-foot-long trench and a second, 24-foot-long trench were excavated and logged on the future Murray Middle School site. A strike-slip fault was identified on the west side of the campus and was projected to have an orientation of north-northeast along the edge of the proposed athletic field. Based on the observations of the fault investigation, proposed structures were designed to be set back over 50 feet from the fault. Sites #1 and #2 lie within the projection of the northern end of the designated setback zone. The four sites are not within or immediately adjacent to (i.e., within a few hundred feet) an Alquist-Priolo Earthquake Fault Zone (California Geological Survey 2019).

3.2.2 Would the project involve the construction, reconstruction, or relocation of any school building on the trace of a geological fault along which surface rupture can reasonably be expected to occur within the life of the school building?

Potentially Significant Hazard for Sites #1 and #2. Although the four sites are not within or immediately adjacent to an Alquist-Priolo Earthquake Fault Zone (see 3.2.1), there may be an active fault crossing Sites #1 and #2. The active fault is a segment of the Little Lake Fault Zone, for which BSK Associates performed a fault investigation. A strike-slip fault was identified on the west side of Murray Middle School and projected to have a north-northeast orientation along the edge of the proposed athletic field. It is recommended that a fault investigation be conducted for both Sites #1 and #2.

Figure 4 - Potential School Sites



Source: ESRI, 2019

3. Environmental Analysis

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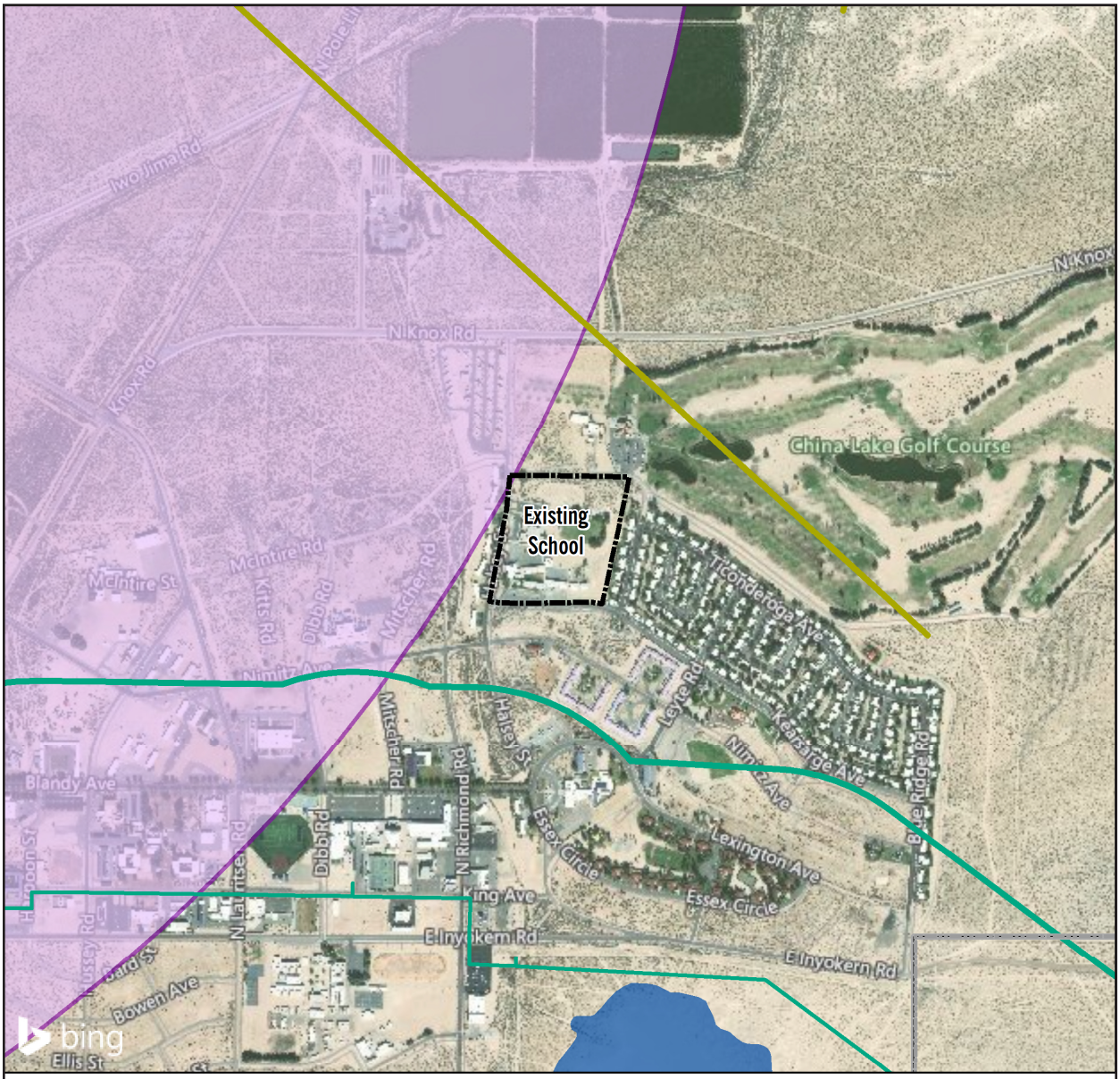
Figure 5 - Existing School



Source: ESRI, 2019

3. Environmental Analysis

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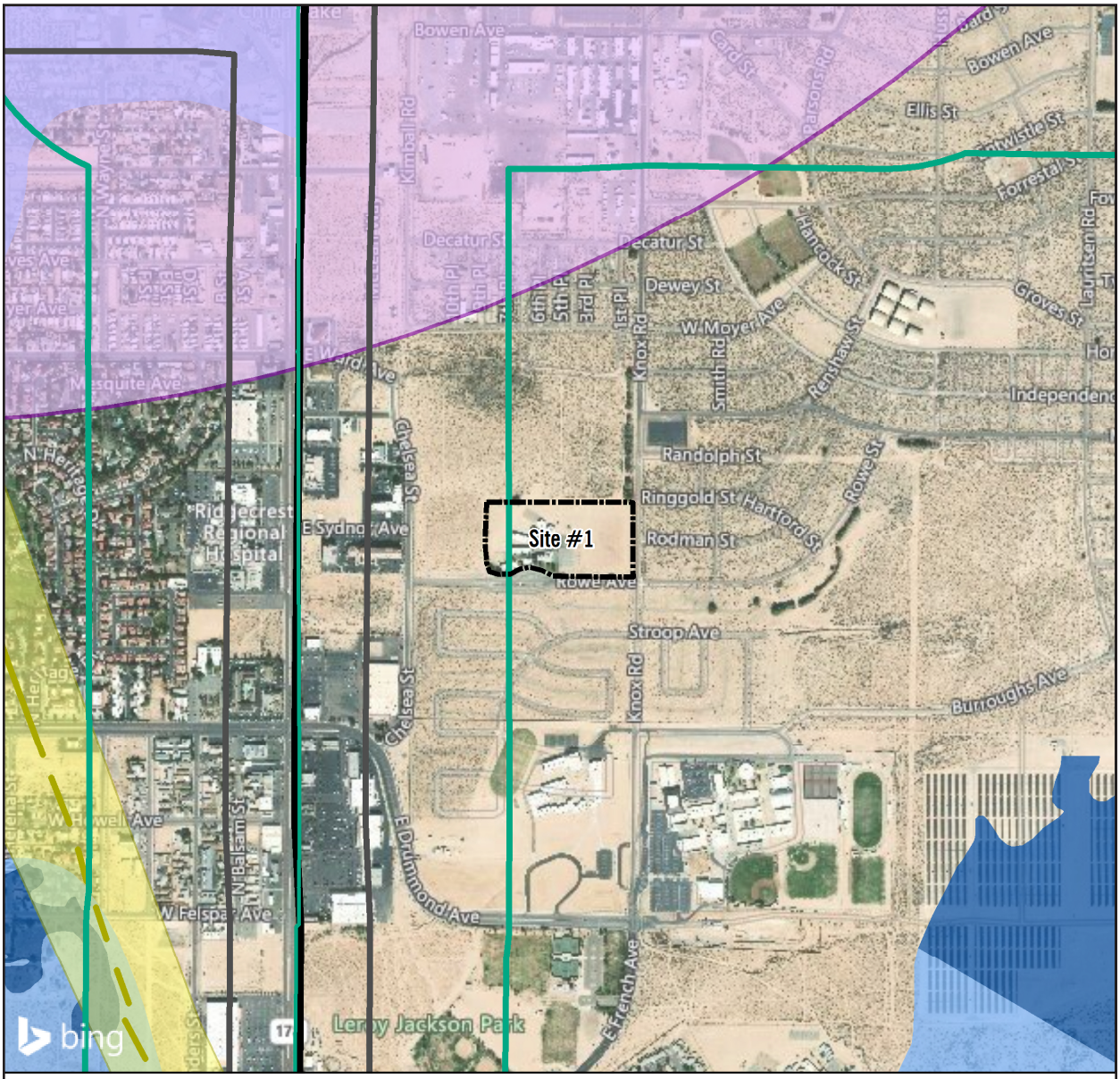
Figure 6 - Site #1



Flood Hazards
- 100-Year Flood Zone
- 500-Year Flood Zone

Natural Gas Pipelines
- Natural Gas Pipelines
- Natural Gas Pipelines 1,500' Buffer

Electrical Transmission Lines
- Electrical Transmission Lines
- Electrical Transmission Line Buffer

Faults
- Fault Line
- Alquist-Priolo Fault Hazard Zones

Highways
- Highway
- Highway 500' Buffer

Airport Runways
- 2 Nautical Mile Buffer

- Potential Sites
- KernBoundary
- City Limits

0 1,500
Scale (Feet)

Source: ESRI, 2019

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3. Environmental Analysis

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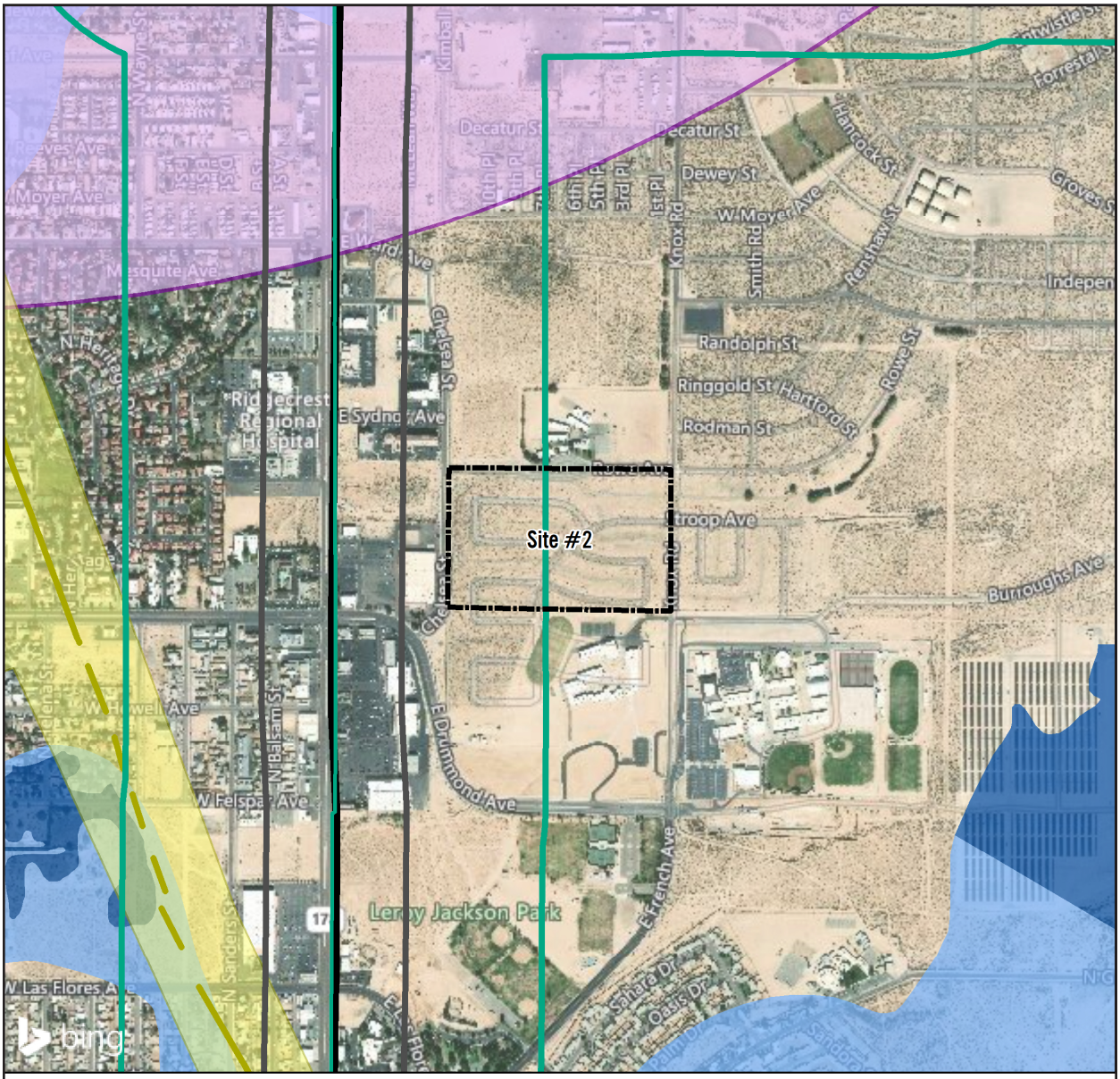
Figure 7 - Site #2



Source: ESRI, 2019

PlaceWorks

3. Environmental Analysis

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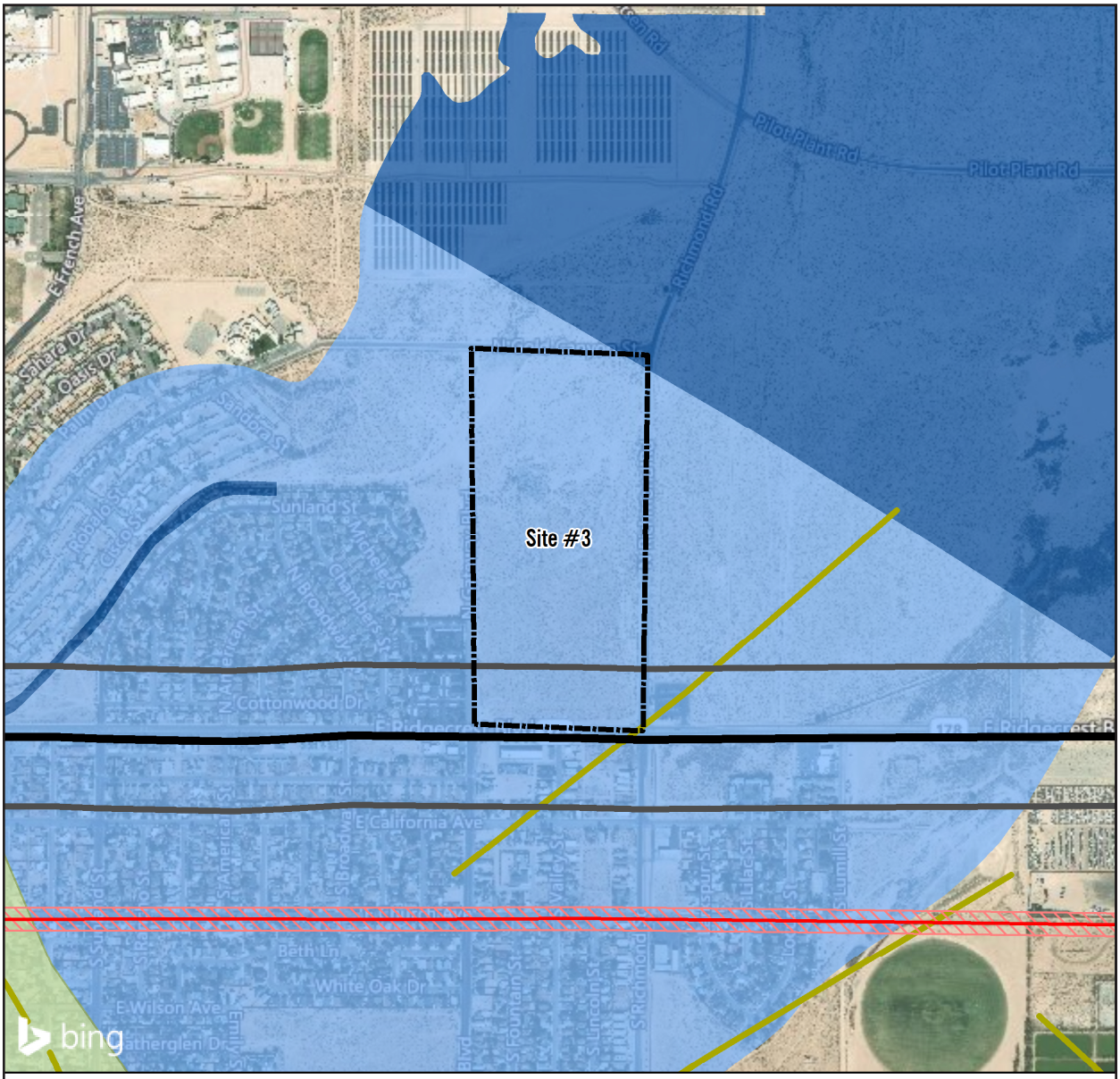
Figure 8 - Site #3



Source: ESRI, 2019

PlaceWorks

3. Environmental Analysis

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3.2.3 Would the project involve the construction, reconstruction, or relocation of any school building on a site subject to moderate-to-high liquefaction, landslides, or expansive soils?

Potentially Significant Hazard for Richmond Elementary School. Liquefaction refers to loose, saturated sand, or gravel deposits that lose their load-supporting capability when subjected to intense shaking. Liquefaction potential varies based upon three main contributing factors: 1) cohesionless, granular soils having relatively low densities (usually of Holocene age); 2) shallow groundwater (generally less than 50 feet); and 3) moderate to high seismic ground shaking. Based on the depth to groundwater, Sites #1, #2, and #3 have a very low susceptibility to liquefaction. Due to the depth of groundwater in the area of Richmond Elementary School (reported as 23.8 feet below ground surface about 170 feet north of the existing campus), the site is considered susceptible to liquefaction (CDWR 2019). Mitigation measures for liquefaction would need to be designed based on a site-specific geotechnical investigation of Richmond Elementary School.

A landslide is a type of erosion in which masses of earth and rock move downslope as a single unit. Susceptibility of slopes to landslides and other forms of slope failure depend on several factors. These are usually present in combination and include steep slopes, condition of rock and soil materials, presence of water, formational contacts, geologic shear zones, and seismic activity. The project sites and their adjoining properties are relatively level and exhibit no substantial elevation changes or unusual geographic features. In the absence of significant ground slopes, the potential for landslides at the site is very low. Therefore, the project would not expose people or the new school buildings to adverse effects associated with landslides.

Expansive soils swell when they become wet and shrink when they dry out, resulting in the potential for cracked building foundations and in some cases, structural distress of the buildings themselves. In each case, minor to severe damage to overlying structures is possible. All improvements would be performed in compliance with the California Building Code and requirements of the Division of the State Architect. Therefore, the project would not expose people or the new school buildings to adverse effects associated with expansive soils.

3.3 HAZARDS AND HAZARDOUS MATERIALS

3.3.1 Does the proposed school site contain one or more pipelines, situated underground or aboveground, which carry hazardous substances, acutely hazardous materials, or hazardous wastes, unless the pipeline is a natural gas line that is used only to supply natural gas to that school or neighborhood?

Potentially Significant Hazard for Sites #1 and #2. One high-pressure natural gas pipeline was identified within 1,500 feet of Sites #1 and #2. There are no chemical or petroleum pipelines within a 1,500-foot radius according to the National Pipeline Mapping System online mapping database (NPMS 2019).

Natural gas pipeline data were obtained from Pacific Gas & Electric Company (see Appendix A). There is an eight-inch, high-pressure natural gas service pipeline beneath N. China Lake Boulevard, west of and within 1,500 feet of Sites #1 and #2. The pipeline was constructed in 1990 and has a maximum allowable operating pressure of 400 pounds per square inch. It is constructed of steel with a wall thickness of 0.188 inch and is wrapped and equipped with an induced current cathodic protection system to minimize corrosion. The

pipeline is inspected annually in accordance with Title 49 of the Code of Federal Regulations, Part 192 and the California Public Utilities Commission General Order 112E. A Pipeline Safety Hazard Assessment is recommended for Sites #1 and #2.

3.3.2 Is the proposed school site located near an aboveground water or fuel storage tank or within 1,500 feet of an easement of an aboveground or underground pipeline that can pose a safety hazard to the site?

Aboveground Water or Fuel Storage Tank

No Significant Hazard. No aboveground water or fuel storage tanks were identified within a 1,500-foot radius of the four sites based on a review of Google Earth Pro (2019) and a topographic map (USGS 2018). The development of the project will not create a new hazard or exacerbate the current conditions.

Hazardous Substance Pipelines

Potentially Significant Hazard for Sites #1 and #2. One high-pressure natural gas pipeline was identified within 1,500 feet of Sites #1 and #2 (see Appendix A). There are no chemical or petroleum pipelines within a 1,500-foot radius according to the National Pipeline Mapping System online mapping database (NPMS 2019).

Natural gas pipeline data were obtained from Pacific Gas & Electric Company (see Appendix A). There is an eight-inch, high-pressure natural gas service pipeline beneath N. China Lake Boulevard, west of and within 1,500 feet of Sites #1 and #2. The pipeline was constructed in 1990 and has a maximum allowable operating pressure of 400 pounds per square inch. It is constructed of steel with a wall thickness of 0.188 inch and is wrapped and equipped with an induced current cathodic protection system to minimize corrosion. The pipeline is inspected annually in accordance with 49 CFR 192 and CPUC 112E regulations. A Pipeline Safety Hazard Assessment is recommended for Sites #1 and #2.

Sewer and Water Pipelines

Potentially Significant Hazard for Richmond Elementary School, Sites #1, #2, and #3. Three large-volume (≥12-inch diameter) water pipelines are within 1,500 feet of Sites #1 and #2. The Indian Wells Valley Water District (IWVWD) owns and operates a 12-inch water pipeline beneath Chelsea Avenue (see Appendix A). Another 12-inch water pipeline is beneath Drummond Avenue and ties into a third 12-inch water main beneath N. China Lake Boulevard, which is also owned and operated by IWVWD. Based on the response from IWVWD, Searles Valley Minerals operates a large-volume pipeline along Ridgecrest Boulevard, which could potentially affect Site #3 (see Appendix A). However, the exact diameter and the contents of this pipeline have not yet been verified by Searles Valley Minerals. Information on the waterlines on NAWS China Lake has not yet been received from the Navy, so additional large-volume water lines may yet be identified within 1,500 feet of all four sites. A Water Pipeline Safety Assessment is recommended for all the large-diameter water lines that are identified within 1,500 feet of the four sites.

Based on the response from the City of Ridgecrest, there are no pressurized sewer lines within 1,500 feet of the site (see Appendix A). However, information on pressurized sewer lines has not yet been received from the Navy, so pressurized sewer lines may yet be identified within 1,500 feet of all four sites.

3.3.3 Is the school site in an area designated in a city, county, or city and county general plan for agricultural use and zoned for agricultural production, and if so, do neighboring agricultural uses have the potential to result in any public health and safety issues that may affect the pupils and employees at the school site? (Does not apply to school sites approved by CDE prior to January 1, 1997.)

No Significant Hazard. Based on a review of the City of Ridgecrest General Plan (2009) and a review of the California Important Farmland Finder maintained by the Division of Land Resource Protection (DLRP 2019), the four sites and adjoining areas are not zoned for agricultural production.

3.3.4 Is the property line of the proposed school site less than the following distances from the edge of respective power line easements: (1) 100 feet of a 50–133 kV line; (2) 150 feet of a 220–230 kV line; or (3) 350 feet of a 500–550 kV line?

No Significant Hazard. Southern California Edison (SCE) provides electrical service to the project area and was contacted to determine the existence and location of power lines and power-line easements within the immediate vicinity of the site. There are no SCE facilities of 50kV or higher within 350 feet of the sites. Project implementation would not expose people to adverse effects associated with high-voltage power lines.

3.3.5 Does the project site contain a current or former hazardous waste disposal site or solid waste disposal site and, if so, have the wastes been removed?

No Significant Hazard. Based on a review of GeoTracker, EnviroStor, EnviroMapper and SWIS databases, the four sites are not located on a current or former hazardous waste disposal site or solid waste disposal site (DTSC 2019; SWRCB 2019; USEPA 2019; CalRecycle 2019).

3.3.6 Is the project site a hazardous substance release site identified by the state Department of Health Services in a current list adopted pursuant to § 25356 for removal or remedial action pursuant to Chapter 6.8 of Division 20 of the Health and Safety Code?

No Significant Hazard. Based on a review of the EnviroStor and GeoTracker databases, no hazardous substance release sites were identified on the four sites (DTSC 2019; SWRCB 2019).

3.3.7 If prepared, has the risk assessment been performed with a focus on children's health posed by a hazardous materials release or threatened release, or the presence of naturally occurring hazardous materials on the school site?

Potentially Significant Hazard for Richmond Elementary School, Site #1, and Site #2. It was recommended that Richmond Elementary School and the Vieweg Adult Education campus (Site #1) be assessed for the potential of impacts from using oil to suppress dust, which may have happened in the 1940s and 1950s. The existing buildings at Richmond Elementary School and Site #1 and the former base housing at Site #2 would also need to be assessed for organochlorine pesticides and lead due to their construction

before lead-based paints and ecologically persistent organochlorine pesticides were banned. The site history of Site #2 is very similar to that of Murray Middle School to the south, where pesticide-impacted soil had to be removed and placed in an underground soil-containment cell. Site #3 appears to be virgin undeveloped, vacant land. Based on the site histories, it appears that the Richmond Elementary School campus, Site #1, and Site #2 would need to have soil sampling, whereas Site #3 may only require a Phase I Environmental Site Assessment. Should state funding be used for construction, DTSC would need to review the investigation of the site that is decided upon for the reconstruction project.

3.3.8 If a response action is necessary and proposed as part of this project, has it been developed to be protective of children's health, with an ample margin of safety?

No Significant Hazard. As stated in Section 3.3.7, based on site histories, it appears that the Richmond Elementary School campus, Site #1, and Site #2 would need to have soil sampling, whereas Site #3 may only require a Phase I Environmental Site Assessment. Should state funding be used for construction, DTSC would need to review the investigation of the site that is decided upon for the reconstruction project. Once these actions have been completed and certified by the DTSC, construction of the school will begin. Therefore, this hazard would not impact the project due to mandatory oversight by the DTSC and adherence to DTSC protocols.

3.3.9 Is the proposed school site situated within 2,000 feet of a significant disposal of hazardous waste?

No Significant Hazard. Based on a 2019 review of the EnviroStor and GeoTracker databases, the project is not within 2,000 feet of a significant disposal of hazardous waste (DTSC 2019; SWRCB 2019).

3.3.10 Is the site within 300 feet of an active oil or natural gas well?

No Significant Hazard. Based on a review of the California Division of Oil, Gas and Geothermal Resources' Well Finder website, the four sites are not within 300 feet of any active oil or natural gas well.

3.4 HYDROLOGY AND FLOODING

3.4.1 Is the project site subject to flooding or tank/dam inundation or street flooding?

No Significant Hazard. According to the 2008 FEMA Flood Insurance Rate Map and the 2015 maps from the California Office of Emergency Services, the four sites do not lie within either a 100-year flood zone or a dam hazard zone. Site #3 is within a 500-year flood zone, but the other three sites are not in any flood zone.

A seiche is an oscillating surface wave in a restricted or enclosed body of water, generated by ground motion, usually during an earthquake. Seiches are of concern relative to water storage facilities, because inundation from a seiche can occur if the wave overflows a containment wall, such as the wall of a reservoir, water storage tank, dam, or other artificial body of water. No water storage facilities are in the immediate vicinity of the four sites that could potentially result in flooding at the site. The closest large water body is Mirror Lake, a playa downgrade of the four sites. Due to its distance, the ephemeral nature of the playa, and the topography that separates the four sites from Mirror Lake, impacts from a seiche are not of concern. Project

implementation would not expose people or structures to adverse effects associated with flooding or inundation.

3.5 LAND USE AND PLANNING

3.5.1 Would the proposed school conflict with any existing or proposed land uses, such that a potential health or safety risk to students would be created?

No Significant Hazard. The existing school is in an area characterized with suburban development. Vacant land is north and south of Richmond Elementary School. Site #1 has an existing adult education campus and is surrounded by vacant land. Site #2 is currently vacant land, surrounded by vacant land to the east, vacant land and Vieweg Adult Education campus to the north, Murray Middle School on the south, and a vacant commercial building to the west. Site #3 is vacant land surrounded by vacant land on all sides as well as residential development to the west, a gas station to the southwest, a strip mall to the south, and a parking lot to the east. Though some nearby parcels are zoned for commercial use, those within one-quarter mile of Sites #1, #2, and #3 are mainly retail-commercial.

Additionally, based on the "Final Air Installations Compatible Use Zones [AICUZ] Study Naval Air Weapons Station China Lake, California" (April 2011), all of Site #1, the eastern half of Site #2, and all but the southwest corner of Site #3 are within the 2007 AICUZ Military Influence Area and 2011 AICUZ footprint for Armitage Airfield, which is approximately three miles north of Sites #1 and #2. According to the AICUZ, the affected areas of the sites are within the airfield's designated "approach clearance surface," which is the horizontal air space designated for aircraft arrival. These portions of the sites are also within the outer limits of the airfield's Noise Zone 1, which is the area with aircraft noise levels between 60 to 65 dB CNEL. These designations do not preclude a school. The existing Richmond Elementary School is within this zone and a portion of Site #3 is within the conditionally acceptable noise level of 70 dB CNEL.

Therefore, land uses as prescribed by the City of Ridgecrest and AICUZ do not preclude the development of the four sites with the proposed school use.

3.5.2 Is the site within a designated Farmland Security Zone?

No Significant Hazard. None of the four sites is an agricultural preserve or 100 acres in size. A review of the California Important Farmland Finder maintained by the Division of Land Resource Protection (DLRP 2019) showed that the four sites are mapped as Vacant or Disturbed Land, Urban and Built-Up Land, or Nonagricultural and Natural Vegetation. No agricultural uses exist on any of the four sites. According to the Farmland Mapping and Monitoring Program, the sites and surrounding area contain no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (DLRP 2019).

3.6 TRANSPORTATION/TRAFFIC

3.6.1 Is the site easily accessible from arterials and is the minimum peripheral visibility maintained for driveways per Caltrans' Highway Design Manual?

No Significant Hazard. The existing Richmond Elementary School is accessible from Kearsarge Avenue and Halsey Avenue. Roadways within the secured area of NAWS China Lake experience low traffic volumes with no congestion or excessive delays. The existing school access driveways off Kearsarge Avenue and Halsey Avenue are located on minor roads with low traffic volumes and speeds and do not have obstructions. A review of aerial photograph and a site visit indicated that sufficient peripheral visibility is provided at access driveways, as designated in the Caltrans Highway Design Manual. The reconstruction of the school on the existing campus would maintain these conditions.

Site #1 is accessible from Rowe Street in the unsecured portion of NAWS China Lake. Site #1 is adjacent to Knox Road, but is separated from it by base fencing. Site #1 can be accessed via Rowe Street and Knox Road, which are minor roads with low traffic speeds and volumes. A review of aerial photography and a site visit indicate that both roads are relatively flat and clear of major sight obstructions that would affect peripheral visibility, as designated in the Caltrans Highway Design Manual.

Site #2 is in the secured area of NAWS China Lake and is currently accessible from Knox Road. It is also adjacent to Chelsea Street and Rowe Street, but is separated from those streets by base fencing. The base fencing may possibly be moved so that Site #2 is outside the secured area of NAWS China Lake, as are the adjacent Site #1 and the adjacent Murray Middle School. The surrounding roadways are straight and carry low traffic volumes at low speeds, so maintaining future driveways for peripheral visibility as designated in the Caltrans Highway Design Manual would be easily attainable.

Site #3 is accessible from Richmond Road, Gold Canyon Street, Gateway Boulevard, and Ridgecrest Boulevard in the unsecured portion of NAWS China Lake. Ridgecrest Boulevard is designated State Route 178 (SR-178) and receives the most traffic of the four streets surrounding Site #3. Due to high speeds and volumes on SR-178, direct site access would be discouraged. Given the straight roads surrounding Site #3, future driveways can be designed to meet the required peripheral visibility designated in the Caltrans Highway Design Manual.

The only street with sidewalks on both sides is Kearsarge Avenue by the existing Richmond Elementary School. A sidewalk on the north side of Rowe Street provides pedestrian access to Site #1. Marked crosswalks with push button detectors and pedestrian crossing signals are already in place at the intersection of Ridgecrest Boulevard and Richmond Road adjacent to Site #3. Additional planning and documentation for pedestrian routes to school would be necessary for Sites #2 and #3, and the lack of crosswalks near Site #1 may also warrant further study. Traffic and pedestrian hazards will be mitigated accordingly and in conformance to Caltrans' School Area Pedestrian Safety Manual.

3.6.2 Is the proposed school site within 1,500 feet of a railroad track easement?

No Significant Hazard. Based on a review of Google Earth Pro (2019), the four sites are not within 1,500 feet of a railroad track easement. The nearest railroad easement is more than 3,000 feet northwest of the Richmond Elementary School, but the tracks have been removed. Project implementation would not expose people to adverse risks associated with railroad safety.

3.6.3 Is the proposed school site within two nautical miles, measured by air line, of that point on an airport runway or potential runway included in an airport master plan that is nearest to the site? (Does not apply to school sites acquired prior to January 1, 1966.)

No Significant Hazard. The existing Richmond Elementary School was acquired prior to January 1, 1966, and therefore is exempt from this requirement. Based on information obtained from the California Department of Transportation, Division of Aeronautics (2005), and a review of area maps and Google Earth Pro (2019), Sites #1, #2, and #3 are not within two nautical miles of an existing airport or proposed airport runway. The closest airport is Armitage Airfield, which is a part of NAWS China Lake.

3.7 EXEMPTIONS TO SITING STANDARDS

3.7.1 Is the district seeking any exemptions to the standards found in CCR, Title 5, § 14010(c-i), (l), (m), (q), (c), (t)?

No Significant Hazard. The District is not seeking any exemptions to the standards found in CCR, Title 5 § 14010(c) through (t).

3.8 SUMMARY

In conclusion, no fatal flaws were identified for any of the sites studied for this investigation of geologic and environmental hazards. However, each of the four sites had at least two "potentially significant hazards," which indicate that additional studies or information would be needed to gain CDE or California Geological Survey approvals. However, the Navy has yet to respond with information concerning water mains under its jurisdiction. The matrix on the next page outlines the general findings of this investigation. For specific information on each issue, please see the discussion in the section cited.

The matrix identifies environmental factors that require further review, but it does not include a sense of the importance or "weight" that should be given to each factor. Richmond Elementary School and Sites #1 and #2 will require assessment for organochlorine pesticides and lead-based paint, which may trigger mitigation like what was required for Murray Middle School. Sites #1 and #2 will likely require trenching to evaluate possible fault traces. These issues appear to carry more weight due to the cost of both further study and possible mitigation.

Site #3 has the fewest environmental constraints and, from that limited standpoint, may be the preferred site. However, many other factors, including logistics, location relative to students, operational costs, and costs of additional studies, are important to consider and were not addressed in this study.

3. Environmental Analysis

	Section 3.1.2	Section 3.2.1	Section 3.2.2	Section 3.2.3	Section 3.3.1	Section 3.3.2	Section 3.3.7
Existing Richmond ES				Potential for Liquefaction		Verify water mains with Navy	Phase I Addendum or PEA
Site #1		Fault Investigation	Fault Investigation		Pipeline Safety Hazard Assessment	Verify water mains with Navy; PSHA (natural gas)	Phase I Addendum or PEA
Site #2	Health Risk Assessment (emergency diesel generator	Fault Investigation	Fault Investigation		Pipeline Safety Hazard Assessment	Verify water mains with Navy; PSHA (natural gas)	Phase I Addendum or PEA
Site #3	Health Risk Assessment (gas station)					Verify water mains with Navy	

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5. List of Preparers

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Appendix

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