Chapter 3
Environmental Impact Analysis

Introduction

This chapter provides an analysis of the physical environmental impacts of implementing the proposed project, as described in Chapter 2, Project Description. It describes the environmental setting, assesses impacts (offsite, onsite, construction-related, operational, direct, and indirect) and cumulative impacts, and identifies mitigation measures to reduce or avoid identified significant environmental impacts.

Scope of Analysis

As discussed in Chapter 1, Introduction, the board of supervisors directed the planning department to undertake further environmental review of the project's potential physical environmental impacts from gentrification and displacement, impacts of the project on historic resources, and geotechnical impacts resulting from construction of the proposed project. Therefore, this chapter of the recirculated draft EIR analyzes the proposed project's potential impacts on the following resources:

Section 3.A, Population and Housing, assessing the project's potential to directly or indirectly result in gentrification or displacement that could result in physical environmental effects.

Section 3.B, Cultural Resources, assessing the project's potential to directly or indirectly impact historic resources, including individual historic resources, historic districts, and contributors to historic districts.

Section 3.C, Geology and Soils, assessing the potential geology and soils impacts of the proposed project, including the feasibility of the project foundation, seismicity of the local area, the presence of any nearby existing fault lines and the project's ability to impact them, soil stability characteristics, seismic hazards (e.g., liquefaction), and the characteristics of site soil.

The board of supervisors' findings determined that "as to all other topics studied in the final EIR, that document complies with CEQA; is adequate, accurate and objective; is sufficient as an informational document; its conclusions are correct; and it reflects the independent judgment of the City." Thus, this chapter of the recirculated draft EIR does not include any other sections of the initial study or previously circulated draft EIR.

The initial study prepared for the previously circulated draft EIR analyzed the proposed project's potential impacts on population and housing, cultural resources, and geology and soils. The initial study analysis for those topics is included in the following sections of this recirculated draft EIR, and has been updated to include additional analysis related to gentrification and displacement, historic resources, and geotechnical impacts. Each resource section shows new text in double underline and deleted text in ~~strikethrough~~. Any analysis that has not changed from what was presented in the previously circulated draft EIR (which includes the initial study appended to that document) is presented as clean text or by reference to the initial study. Some text has been moved from its original

location in the initial study to be consistent with the format of an EIR, but is otherwise unchanged unless it includes a double underline or ~~strikethrough~~.

Each resource section discusses the environmental setting, which describes the current physical conditions, or baseline conditions, in the project area. As discussed in Chapter 1, Introduction, the baseline used for environmental impact analysis under CEQA reflects the conditions present at the time the NOP for the previously circulated draft EIR was published. The NOP and initial study for the previously circulated draft EIR were published on October 2, 2019.

CEQA Methodological Requirements

CEQA Guidelines section 15151 describes standards for the preparation of an adequate EIR. The specific standards under section 15151 are listed below.

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information that enables them to make a decision that intelligently takes into account environmental consequences of the project.
>
> An evaluation of the environmental impacts of a project need not be exhaustive; rather, the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible.
>
> Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts.

In practice, the above points indicate that EIR preparers should adopt a reasonable methodology upon which to estimate impacts. This approach means making reasonable assumptions, using the best information available. In some cases, when information is limited or there are variations in project characteristics, EIR preparers will employ a "reasonable worst-case analysis" to capture the largest expected change from existing baseline conditions resulting from implementation of a project.

Format of Environmental Analysis

Each environmental topic analyzed in this chapter includes the following subsections:

> **Introduction.** This subsection includes a brief description of the types of impacts that are analyzed pursuant to the board of supervisors' direction, as well as a summary of the impacts that were scoped out in the initial study (e.g., impacts that were determined to result in a less-than-significant impact or no impact).
>
> **Environmental Setting**. This subsection presents a description of baseline physical conditions on the project site and in the surrounding areas (e.g., existing land uses, existing wind environment, open space areas) at time of issuance of the NOP (with respect to each resource topic), with enough detail and breadth to allow a general understanding of the environmental impacts of the proposed project.
>
> **Regulatory Framework.** This subsection describes the relevant federal, state, and local regulatory requirements that are directly applicable to the environmental topic being analyzed.
>
> **Impacts and Mitigation Measures.** This subsection describes the physical environmental impacts (e.g., the changes to baseline physical environmental conditions) that could result from implementation of the proposed project, as well as any mitigation measures that could avoid, eliminate, or reduce identified significant impacts. This subsection begins with a listing of the

significance criteria that have been developed by the planning department for use in determining whether an impact is significant. Environmental topic sections also include an "Approach to Analysis" subsection. This discussion explains the parameters, assumptions, and data used in the analysis.

Under the "Impact Evaluation" discussion, the impact analysis for each topic begins with an impact statement that reflects one or more of the applicable significance criteria. Some significance criteria may be combined in a single impact statement, if appropriate. Each impact statement is keyed to a subject area abbreviation (e.g., PH for Population and Housing) and an impact number (e.g., 1, 2, 3) for a combined alpha-numeric code (e.g., Impact PH-1, Impact PH-2, etc.).

If potentially significant impacts are identified, mitigation measures are presented that would avoid, eliminate, or reduce significant adverse impacts of the project. All mitigation measures will be required as conditions of project approval. Each mitigation measure corresponds to the impact statement and has an "M" in front to signify it is a mitigation measure (e.g., Mitigation Measure M-PH-1 for a mitigation measure that corresponds to Impact PH-1). If there is more than one mitigation measure for the same impact statement, the mitigation measures are numbered with a lowercase letter suffix (e.g., Mitigation Measures M-PH-1a and M-PH-1b).

Significance Determinations

A "significant effect" is defined by CEQA Guidelines Section 15382 as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment [but] may be considered in determining whether the physical change is significant."

The significance criteria used in this recirculated draft EIR are based on the planning department's guidance regarding the thresholds of significance for assessing the severity of the environmental impacts of the proposed project. The planning department's guidance is based on CEQA Guidelines Appendix G, with some modifications. The level of significance of the impact is indicated in parentheses at the end of the impact statement based on the following terms:

No Impact. No adverse physical changes (or impacts) to the environment are expected.

Less than Significant. Impact that would not exceed the defined significance criteria or would be eliminated or reduced to a less-than-significant level through compliance with existing local, state, and federal laws and regulations.

Less than Significant with Mitigation. Impact that is reduced to a less-than-significant level through implementation of the identified mitigation measures.

Significant and Unavoidable with Mitigation. Impact that exceeds the defined significance criteria and cannot be reduced to less-than-significant levels through compliance with existing local, state, and federal laws and regulations and/or implementation of all feasible mitigation measures.

Significant and Unavoidable. Impact that exceeds the defined significance criteria and cannot be eliminated or reduced to a less-than-significant level through compliance with existing local, state, and federal laws and regulations and for which there are no feasible mitigation measures.

Cumulative Impacts

Cumulative impacts, as defined in CEQA Guidelines section 15355, refer to two or more individual effects that, when taken together, are "considerable" or that compound or increase other environmental impacts. A cumulative impact from several projects is the change in the environment that would result from the incremental impact of the project when added to the impact of closely related past, present, and reasonably foreseeable future projects. Pertinent guidance for cumulative impact analysis is provided in CEQA Guidelines section 15130:

> An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (e.g., the incremental effects of an individual project are considerable when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).
>
> An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR. A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
>
> The discussion of impact severity and likelihood of occurrence need not be as detailed as the discussion of effects attributable to the project alone.
>
> The focus of the analysis should be on the cumulative impact to which the identified other projects contribute rather than the attributes of the other projects that do not contribute to the cumulative impact.

The cumulative impact analysis for each individual resource topic is described in each resource section immediately following the description of the project impacts and identified mitigation measures.

APPROACH TO CUMULATIVE IMPACT ANALYSIS

Two approaches to a cumulative impact analysis are provided in CEQA Guidelines section 15130(b)(1):

> The analysis can be based on a list of reasonably foreseeable future projects that could produce closely related impacts and combine with those of a proposed project, or
>
> A summary of projections contained in a general plan or related planning document can be used to determine cumulative impacts. The following factors were used to determine an appropriate level for cumulative analysis in this EIR:
>
> > **Similar Environmental Impacts.** A relevant project contributes to effects on resources that are also affected by the proposed project. A relevant future project is defined as one that is "reasonably foreseeable," such as a project with an application on file at the approving agency or approved funding.
> >
> > **Geographic Scope and Location.** A relevant project is within the geographic area where effects could combine. The geographic scope varies on a resource-by-resource basis. For example, the geographic scope for evaluating cumulative effects on regional air quality consists of the affected air basin, whereas the cumulative effects of construction noise are limited to combined noise from the project and nearby projects.

Timing and Duration of Implementation. Effects associated with activities for a relevant project (e.g., short-term construction or demolition, long-term operations) would most likely coincide with the timing of related effects from the proposed project.

The analyses in this recirculated draft EIR employ a list-based approach and projections-based approach, depending on the environmental topic analyzed. For instance, the cumulative analysis of cultural resources impacts is a list-based approach as it considers whether the list of cumulative projects in Table 3-1 in combination with the proposed project could impact the same individual historic resources, historic districts, and contributors to historic districts. Whereas the cumulative analysis of population and housing impacts is a projections-based approach as it considers the Association of Bay Area Government's (ABAG) Plan Bay Area projections for population and employment growth in San Francisco and development projects in the pipeline. Whether the proposed project in combination with cumulative projects would exceed the ABAG projections for planned growth in San Francisco is one consideration of whether the proposed project could result in a cumulative population and housing impact.

CUMULATIVE SETTING

Cumulative projects within a 0.25-mile radius of the project site are listed below in Table 3.A-1 and mapped on Figure 18. These cumulative projects are projects that are currently under review by the planning department, or a building permit is on file or has been approved by the San Francisco Department of Building Inspection (building department) at the time the NOP was published on October 2, 2019. Due to the time that has elapsed since the previously circulated draft EIR, some of the cumulative projects listed below have been approved by the planning commission, are under construction, have been completed, or have been withdrawn, and additional projects have been proposed. As such, the table below has been updated to show the status of the cumulative projects at the time of publication of the previously circulated draft EIR, the current status of those projects, and new cumulative projects identified at the time of preparation of this recirculated draft EIR.

Table 3-1: Cumulative Projects within 0.25-Mile Radius of the Proposed Project

Map No. Address (Case No.)	Description	Dwelling Units	Retail/ Commercial (gsf)	Office (gsf)	Hotel (gsf)	PDR[1] (gsf)	Group Housing Rooms	Status in the Previously Circulated Draft EIR	Current Status
1.1025 Howard Street (2015-005200ENV)	Demolition of an existing building and construction of a new 8-story hotel with a ground floor retail space and below ground parking.	--	2,445	--	77,510 173 rooms	--	--	Under review	Under review
2.1053-1055 Market Street (2014.0408E)	Demolition of an existing two-story commercial building and construction of a 10-story hotel with 157 rooms and a ground floor retail space.	--	2,117	--	67,903 157 rooms	--	--	Approved - not yet under construction.	Approved 12/7/2017- not yet under construction.
3.1082 Howard Street (2015-010371ENV)	Demolition of a 2-story retail sales building and construction of a 9-story multi-family residential building.	9	--	--	--	--	--	On Hold	Withdrawn 5/4/2020
4.1088 Howard Street (2017-009796ENV)	The proposed project would preserve the existing one story over mezzanine industrial building and construct an approximately 20,402 gsf, 74-foot-tall residential addition.	24	--	--	--	--	--	Under Review	Approved 3/2/2020– not yet under construction
5.1125 Market Street (2013.0511E)	Construction of a 12-story, 138,101 sf building containing 181 hotel rooms, 5,587 sf of restaurant/retail, and a 18,737 sf co-working space/office.	--	5,587	18,737	95,506 181 rooms	--	--	Under Review	On Hold
6.219 Sixth Street (2017-001590CUA)	Change of use that would result in a net increase of 9 rooms.	--	--	--	--	--	9 guest rooms	On Hold	Withdrawn – 6/10/2021
7.270 Turk Street (2017-015701PRJ)	Addition of four accessory dwelling units at the basement level of the building.	4	--	--	--	--	--	Under Review	Under Review
8.415-417 Tehama Street (2017-016278PRJ)	Construction of one accessory dwelling unit.	1	--	--	--	--	--	Under Review	Under Review

Map No. Address (Case No.)	Description	Dwelling Units	Retail/ Commercial (gsf)	Office (gsf)	Hotel (gsf)	PDR[1] (gsf)	Group Housing Rooms	Status in the Previously Circulated Draft EIR	Current Status
9.457-475 Minna Street (2018-016055PRJ)	Demolition of an existing 2-story building and proposed merger of four lots and construction of a new 16-story, 270-room group housing building.	--	--	--	--	--	270	Under Review	Under Review
10.481-483 Tehama Street (2015-006765ENV)	Proposed demolition of an existing 2-story building. Construction of a new 4-story residential/ PDR building.	6	--	--	--	1,790	--	Approved – not yet under construction.	Approved 12/10/2019 – not yet under construction.
11.527 Stevenson Street (2018-012429ENV)	Demolition of an existing 1-story commercial building and new construction of a 7-story commercial building.	--	--	7,062	--	--	--	Under Review	Approved 11/8/2021 – not yet under construction.
12.57 Taylor Street aka 111 Turk Street (2015-007525ENV)	Subdivision of parcel containing a mixed-use residential and retail building and a surface parking lot. Demolition of a portion of the existing structure (vacant retail space). New construction of a 12-story over basement mixed-use residential group housing with ground floor retail.	--	11,000	--	--	--	77	Under Review	Withdrawn 1/20/2022
13.611 Minna Street (2018-009426PRJ)	Addition of two new studio accessory dwelling units at the basement level of an existing 12-unit building.	2	--	--	--	--	--	Approved – not yet under construction.	Approved 11/4/2019– not yet under construction.
14.921 Howard Street (2017-000275ENV)	Construction of a new, 18-story, 180-foot-tall mixed-use residential tower and podium.	205	4,999	--	--	--	--	Under Review	Approved 2/25/2020 – Under construction.
15.984 Folsom Street (2017-013741ENV)	Demolition of a 3-story building and construction of a new 8-story building with a restaurant on the ground floor and group housing on the remaining seven floors.	--	9,115	--	--	--	111	Under Review	Under Review

Commented [TK1]: Believe this project is approved

Map No. Address (Case No.)	Description	Dwelling Units	Retail/ Commercial (gsf)	Office (gsf)	Hotel (gsf)	PDR[1] (gsf)	Group Housing Rooms	Status in the Previously Circulated Draft EIR	Current Status
16. 996 Mission Street (2015-015253 ENV)	Demolition of 2-story existing residential hotel building. New construction of an 8-story hotel (2 floors residential hotel units, 5 floors tourist hotel) with ground floor retail.	--	--	--	5,645 (105 rooms)	--	--	Under Review	Withdrawn 7/2/2019
17. Better Market Street (2014.0012E)	The multi-agency project would replace and upgrade aging infrastructure – including streetlights, traffic signals, streetcar tracks, overhead wires, and underground utilities.	--	--	--	--	--	--	Approved - implementation of near-term improvements beginning January 2020; full construction beginning late 2020 or early 2021.	The first phase, Market Street between Fifth and Eighth streets anticipated late 2022.
18. Fifth Street Improvement Project	This project involves bicycle and pedestrian safety improvements along Fifth Street between Townsend and Market streets in the SoMa neighborhood.	--	--	--	--	--	--	Approved – construction of near-term improvements in Fall 2019.	Construction of long-term improvements summer/fall 2022
19. 1010 Mission Street	This project proposed new construction of a nine-story residential building with 57 Single Room Occupancy units and a street-level commercial space.	57	450	--	--	--	--	NA	Proposed

Commented [VS(x2]: The proposed project (new 9-story building on a vacant lot) appears to be mislabeled as 1010 Mission Street in the application. It is actually on the vacant lot between 1010 Mission street (which is a historic resource) and the Kean Hotel at 1018 Mission Street. My recommendation is to assign a different address (perhaps 1014 Mission Street) to avoid this confusion because the current text implies the historic resource at 1010 Mission would be demolished or altered, which is not the case. Rather, this project would be adjacent to the historic resource at 1010 Mission Street.

Map No. Address (Case No.)	Description	Dwelling Units	Retail/ Commercial (gsf)	Office (gsf)	Hotel (gsf)	PDR[1] (gsf)	Group Housing Rooms	Status in the Previously Circulated Draft EIR	Current Status
20. 580 Minna Street	New construction of a seven-story building with 20 dwelling units.	20	--	--	--	--	--	NA	Under Review
21. 67 Taylor Street	RedMint One proposes a Personal Services holistic health/wellness center with acupuncture related services, (e.g., body cupping and moxa), herbal bar, facial and beauty services, yoga and Pilates, day spa, foot and hand reflexology, and incidental massage establishment at 65 Taylor Street. The Property is a 18,905 square foot corner lot fronting both Taylor and Turk Streets, and is improved with a 5-story mixed-use building constructed in 1906 with residential above retail. The Project will occupy 2,980 sf in the building's vacant ground floor retail space as well as 4,535 sf in the basement.	--	7,515	--	--	--	--	NA	On Hold

Notes:

PDR – Production, Distribution, Repair

The Fifth Street Improvement Project was considered in the cumulative transportation analysis in Section E.5, Transportation and Circulation, of the initial study; however, this project was not included in this list of cumulative projects specifically listed in the initial study. This project was considered in the cumulative analysis of the previously circulated draft EIR.

Map No. Address (Case No.)	Description	Dwelling Units	Retail/ Commercial (gsf)	Office (gsf)	Hotel (gsf)	PDR[1] (gsf)	Group Housing Rooms	Status in the Previously Circulated Draft EIR	Current Status

Better Market Street near-term improvements include the following changes within the project corridor: a car-free zone westbound from Steuart Street to Van Ness Avenue and eastbound from 10th Street to Main Street; new passenger and commercial loading zones on cross streets; peak-hour loading restrictions on Market Street; extending the existing transit-only lane east from Third to Main Street and making it available to Muni only; painted safety zones at eight intersections; bicycle intersection improvements; vehicle circulation changes to sections of Ellis, Jones, 2nd and Steuart streets.

Sources:

San Francisco Planning Department. 2019 and 2022. San Francisco Planning Department – Permits in my Neighborhood Map. https://sfplanning.org/resource/permits-my-neighborhood. San Francisco Public Works Department. 2019 2022. Projects Database. https://sfpublicworks.org/projects.

3.C Geology and Soils

3.C.1 Introduction

As directed by board of supervisors' motion M21-182 in file no. 211278, this section of the recirculated draft EIR updates the geology and soils analysis presented in the initial study for the previously circulated draft EIR. It discusses the relevant environmental setting, regulatory framework, environmental impacts, and mitigation measures related to the potential geotechnical impacts that could result from construction of the proposed project and cumulative projects. The impact analysis focuses on whether the proposed project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving rupture of a known earthquake fault, seismic ground shaking, liquefaction, and landslides (Impact GE-1); be located on an unstable geologic unit or soil (Impact GE-3); and be located on expansive soil (Impact GE- 4).

As to all other subtopics covered under the Geology and Soils topic in the initial study, the board of supervisors' motion found that the previously circulated draft EIR, "complies with CEQA; is adequate, accurate and objective; is sufficient as an informational document; its conclusions are correct; and it reflects the independent judgement of the City." Therefore, the following additional subtopics are considered adequately addressed in the previously circulated initial study and are not addressed further in this section: substantial soil erosion or the loss of topsoil (Impact GE-2), soils incapable of supporting septic systems or alternative wastewater systems where sewers are not available (Impact GE-5), and paleontological resources (Impact GE-6).

3.C.2 Environmental Setting

This section summarizes the subsurface conditions of the project site and potential seismic hazards, including fault rupture, ground shaking, liquefaction, lateral spreading, and seismic densification.

A preliminary geotechnical report was prepared on August 18, 2017 for the initial study by Langan Engineering and Environmental Services, Inc (geotechnical consultant). The preliminary geotechnical report prepared for the initial study relied on available subsurface information in the site vicinity to develop preliminary conclusions and recommendations.

Since publication of the previously circulated draft EIR, the geotechnical consultant has conducted a further geotechnical investigation at the project site. The results of this further geotechnical investigation are presented in the 2022 preliminary geotechnical report (Appendix D), and included the following (1) evaluating site conditions by drilling two borings to bedrock within the project site in 2020, obtaining shear wave velocity data in one of the borings, and performing laboratory tests on representative soil samples; (2) performing preliminary engineering analyses to develop preliminary recommendations regarding the geotechnical aspects of the project; and (3) the results of a preliminary settlement analyses of a mat foundation performed using Settle3 for the settlement model based on the project site's subsurface conditions, average foundation pressures, depth of excavation, dewatering assumptions, and anticipated building loads. The building loads provided to

Settle3, version 4.023.

the geotechnical consultant are based on the building's anticipated concrete construction material. As such, the following information is based on the findings presented in the 2022 preliminary geotechnical report.

SUBSURFACE CONDITIONS

~~The following discussions are based on the information and findings provided in the *preliminary geotechnical investigation* completed by Langan Engineering and Environmental Services, Inc on August 18, 2017. The preliminary geotechnical investigation relied on available subsurface information in the site vicinity to develop preliminary conclusions and recommendations. Pursuant to the geotechnical report, the specific geologic units beneath the project site are as follows (from shallowest to deepest):~~

San Francisco is located within the geologically complex California Coast Range geomorphic province which is characterized by a series of northwest-trending ridges and valleys that run roughly parallel to the San Andreas Fault Zone, and can be further divided into the northern and southern ranges that are separated by the San Francisco Bay. The project site is generally underlain with fill, Dune sand, Marsh deposit, Colma Formation sand, Old Bay Clay, alluvium/residual soil, and Franciscan Complex bedrock. The site is outside the historic shoreline, locally referred to as the Sullivan Marsh (Figure 3 in Appendix D, pg. X) and within the regional seismic hazard zones map (Figure 6 in Appendix D, pg. X).

The material types and general descriptions of these subsurface materials are provided below and informed by the two soil borings conducted for the 2022 preliminary geotechnical report. The soil borings were drilled on the project site at the locations shown in Figure ; boring 1 (LB-1) is located approximately 22 feet from Jessie Street and boring 2 (LB-2) is located approximately 8 feet from Jessie Street at the eastern side of the site. Borings LB-1 and LB-2 were drilled within/near the proposed tower footprint (see Figure X).

~~**Sandy Fill:** Sandy fill depths across the project site range from approximately 5 to 10 feet thick and 35 to 40 feet bgs.~~

~~**Native Sand:** Native sand under the project site is medium dense and is approximately 20 feet thick and 35 to 40 feet bgs.~~

Fill: The site is blanketed by 8 to 8.5 feet of very loose to medium dense sand with varying silt and clay contents, with brick, concrete, and other debris fragments.

Dune Sand: The fill is underlain by a 19- to 19.5-foot-thick layer of fine-grained, poorly graded sand (Dune sand). The sand is loose to dense, and typically grades denser with depth. The sand is moist to wet and extends to depths of 27 to 28 feet below the ground surface (bgs), an approximate elevation of 2 feet above sea level.

Marsh Deposit: ~~Marsh deposits on the site range from 5 to 15 feet thick and 35 to 40 feet bgs~~. A 6.5- to 10-foot-thick Marsh deposit underlays the Dune sand. This deposit consists of medium

To accurately estimate building loads it is necessary to know the anticipated material for construction of a building. Concrete in heavier than other types of construction material, such as steel. This weight can substantially affect building loads used for settlement analysis. The project sponsor is proposing a concrete building and the building loads were calculated using that assumption.

~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~

Elevations in the 2022 preliminary geotechnical report are based on Historic City of San Francisco datum.

dense clayey sand and medium stiff sandy clay. The bottom of the Marsh deposit extends to depths of 37 to 38 feet bgs, approximate elevation of -7 to -9 feet.

Colma Formation: Beneath the Marsh deposit (below depths of 37 to 38 feet bgs) is a 60- to 77.5-foot thick layer of sandy soil with varying clay and silt content, known locally as the Colma Formation. The Colma Formation is generally dense to very dense, is generally strong and relatively incompressible. The Colma Formation extends to depths of 98 and 114.5 feet bgs, about an elevation of -69 and -84.5 feet. A 2-foot-thick medium silt clay layer was encountered at 89 feet bgs within the Colma Formation at Boring LB-2.

Sand: ~~The dense to very dense sand below the marsh deposit is of the Colma formation and is approximately 40 feet thick and 80 feet bgs.~~

Old Bay Clay: ~~The old bay clay on the site consists of stiff to hard sandy clay and is approximately 5 to 15 feet thick. The top of the old bay clay layer is located at approximately 80 to 90 feet bgs.~~ The Colma Formation is underlain by a 24- to 37-foot-thick layer of marine clay known locally as Old Bay Clay. Old Bay Clay is medium stiff to very stiff with overconsolidation ratios of about 1.8 to 2.0. The Old Bay Clay extends to depths of 135 to 138.5 feet bgs, about an elevation of -106 to -108.5 feet.

Alluvium/Residual Soil: The Old Bay Clay is underlain by dense to very dense sand and very stiff to hard clay (alluvium and residual soil) to bedrock. Consolidation test results indicate the alluvial clay is overconsolidated and slightly compressible. The alluvium/residual soil extends to depths of about 243 to 249 feet, about an elevation of -220 to -213 feet, which is approximate top of bedrock.

Bedrock: ~~Bedrock is likely located at approximately 200 feet bgs.~~ Bedrock at the site consists of a Franciscan Complex Mélange, typically a mixture of sheared and folded sedimentary, igneous, and metamorphic rocks resulting from large-scale tectonic processes. Bedrock consists predominantly of siltstone and sandstone, and is intensely fractured to fractured, low to moderately hard, weak to friable, and little weathered.

~~According to the preliminary geotechnical report, the loose to medium dense sandy fill, native sand, and marsh deposit, that likely extend 35 to 40 feet bgs, are not suitable for supporting the proposed project. Therefore, the proposed building and three-level below-grade parking structure may be supported on a mat foundation provided the soil beneath the mat is improved to the top of the dense to very dense sand. Ground improvement may include soil-cement-columns or drilled displaced columns extending at least 10 feet into the dense sand below the marsh deposit. Alternatively, the structure may be supported on deep foundations gaining support in dense to very dense sand beneath the marsh deposit. A mat or a structurally supported slab can be used with deep foundations. As such, to construct the three-level below-grade parking structure, and a 10-foot thick mat, it is anticipated a 55-foot excavation is required for the proposed project.~~

Overconsolidation ratio refers to the ratio of the maximum past pressure a soil has experienced over the existing effective overburden pressure felt by the clay under today's conditions.

~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~

During the 2020 field investigation (drilling of Borings LB-1 and LB-2 included in the 2022 preliminary geotechnical report), groundwater levels were measured in the borings at approximately 19.5 and 32 feet from existing site grades during and after drilling. However, as discussed in the 2022 preliminary geotechnical report, these measurements do not represent stabilized groundwater levels as the groundwater levels would vary seasonally depending on rainfall infiltration and time of year. In addition, the groundwater levels would vary from dewatering activities in the vicinity and utility leaks. On the basis of the available groundwater information (including the historic groundwater levels, between 10 and 30 feet bgs, assuming an average of 20 feet bgs) and past investigations in the vicinity of the site, and to account for seasonal fluctuations and a reasonable consideration for near-future sea level rise, the preliminary geotechnical investigation estimated the groundwater level within the project site could rise to within 16 feet from existing street grades, which corresponds to an elevation of 13 feet.

REGIONAL SEISMICITY AND FAULTING

The project site is in a seismically active region. Numerous earthquakes have been recorded in the region in the past, and moderate to large earthquakes should be anticipated during the service life of the proposed project. The San Andreas, San Gregorio, and Hayward faults are the major faults closest to the project site. For each of these faults, as well as other active faults within about 50 kilometers (km) of the site, the distance from the site and estimated mean Moment magnitude are summarized in Table 3-2.

Table 3-2: Regional Faults and Seismicity

Fault Segment	Approx. Distance from Fault (km)	Direction from Site	Mean Characteristic Moment Magnitude
San Andreas 1906 event	13.3	Southwest	8.1
Total Hayward-Rogers Creek Healdsburg	17	East	7.6
Total San Gregorio	18	West	7.6
Pilarcitos	20	Southwest	6.7
Contra Costa (Lafayette)	29	East	6.1
Contra Costa Shear Zone (connector)	30	East	6.6
Franklin	31	Northeast	6.7
Contra Costa (Larkey)	32	East	6.0
Contra Costa (Dillon Point)	33	Northeast	6.1
Total Calaveras	33	East	7.5
Monte Vista – Shannon	34	South	7.0
Mount Diablo Thrust	34	East	6.6
Mission (connected)	35	East	6.1

Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.

Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude Is directly related to average slip and fault rupture area.

Concord	39	East	6.4
Green Valley	41	Northeast	6.8
Contra Costa (Vallejo)	41	Northeast	5.6
Contra Costa (Lake Chabot)	42	Northeast	5.6
Clayton	45	East	6.4
West Napa	46	Northeast	6.8
Greenville	48	East	7.1

Since 1800, four major earthquakes have been recorded on the San Andreas fault. In 1836 an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale occurred east of Monterey Bay on the San Andreas fault. The estimated Moment magnitude (M_w) for this earthquake is about 6.25. In 1838, an earthquake with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas fault from Shelter Cove to San Juan Bautista approximately 470 km in length. It has a maximum intensity of XI (MM), and M_w of about 7.9, and was felt 560 km away in Oregon, Nevada, and Los Angeles. The Loma Prieta Earthquake occurred on October 17, 1989 in the Santa Cruz Mountains with an M_w of 6.9, the epicenter of which is approximately 95 km from the project site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (an M_w of about 6.5) was reported on the Calaveras fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2). The most recent earthquake to affect the San Francisco Bay Area occurred on August 24, 2014 and was located on the West Napa fault, approximately 49 km northeast of the project site, with an M_w of 6.0.

The 2016 U.S. Geologic Survey (USGS) predicted a 72 percent change of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area in 30 years. More specific estimates of the probabilities of different faults in the Bay Area are presented in Table 3-3.

Table 3-3: Estimates of 30-Year Probability (2014 to 2043) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	33
Calaveras	26
N. San Andreas	22
San Gregorio	16
Mount Diablo Thrust	16
Greenville	6

SEISMIC HAZARD

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction, lateral spreading, and seismic densification. Each of these conditions has been evaluated in the 2022 preliminary geotechnical report and is summarized below.

FAULT RUPTURE

Historically, ground surface fault rupture closely follows the trace of geologically young faults and occurs when movement on a fault deep within the earth breaks through to the ground surface. The project site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the project site. According to the 2022 preliminary geotechnical report, the risk of fault offset rupture at the project site from a known active fault is low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, the risk of surface faulting and consequent secondary ground failure at the project site is low.

GROUND SHAKING

The seismicity of the project site is predominantly governed by the activity of the San Andreas and Hayward faults. However, ground shaking from future earthquakes on any of the nearby faults could be felt at the project site. The intensity of earthquake ground motion at the project site would depend upon the characteristics of the generating fault, distance to the earthquake fault, magnitude and duration of the earthquake, and specific subsurface conditions.

LIQUEFACTION AND ASSOCIATED HAZARDS

When saturated soil with little to no cohesion liquefies during a major earthquake event, it experiences a temporary loss of shear strength as a result of a transient rise in excess pore water pressure generated by strong ground motion. Flow failure, lateral spreading, loss of bearing, ground fissures, and sand boils are evidence of excess pore pressure generation and liquefaction.

The site is within a liquefaction hazard zone as designated by the California Divisions of Mines and Geology seismic hazard zone map for the area. No observations of liquefaction and lateral spreading were documented near the project site during either the 1906 San Francisco or 1989 Loma Prieta earthquakes. The results of the analyses contained in the 2022 preliminary geotechnical report indicate that the loose and medium dense clayey sand within the Marsh deposit, encountered below the design groundwater level, are susceptible to liquefaction during a major seismic event on a nearby

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Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

Seismic densification (also referred to as Differential Compaction) is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing ground-surface settlement.

Flow¬ failure conditions are divided into two types: (1) unlimited flow if pore-pressure reductions caused by dilatancy during flow deformation are not sufficient to solidify the material and thus arrest flow, and (2) limited flow if they are sufficient to solidify the material after a finite deformation.

fault. The 2022 preliminary geotechnical report estimated that liquefaction-induced settlement in the Dune sand and Marsh deposit sand could be on the order of 2 inches during a Maximum Considered Earthquake Geometric Mean event.

LATERAL SPREADING

Lateral spreading is a phenomenon in which a surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction of a free face, such as a channel, by earthquake and gravitational forces. Lateral spreading is generally the most pervasive and damaging type of liquefaction-induced ground failure generated by earthquakes.

SEISMIC DENSIFICATION

Seismic densification can occur during strong ground shaking in loose, clean granular deposits above the water level, resulting in ground surface settlement. The degree of susceptibility to seismic densification is directly related to the relative density of the existing granular soil.

3.C.3 Regulatory Framework

FEDERAL REGULATIONS

EARTHQUAKE HAZARDS REDUCTION ACT OF 1977

The Earthquake Hazard Reduction Act of 1977 (FEMA 1977) established the National Earthquake Hazards Reduction Program (NEHRP) "to reduce the risks of life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program." The National Earthquake Hazards Reduction Program Act (NEHRPA) substantially amended this program in 1990 by refining the description of the agency responsibilities, program goals, and objectives. The four principal goals of the NEHRPA are:

- Develop effective practices and policies for earthquake loss reduction and accelerate their implementation;
- Improve techniques for reducing earthquake vulnerabilities of facilities and systems;
- Improve earthquake hazards identification and risk assessment methods, and their use; and
- Improve the understanding of earthquakes and their effects.

The NEHRPA designates the Federal Emergency Management Agency as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities.

STATE REGULATIONS ~~TO ADDRESS SEISMIC HAZARDS~~

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT OF 1972 (ALQUIST-PRIOLO ACT)

The Alquist-Priolo Act (Public Resources Code section 2621 et seq.) is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the

location and construction of most types of structures intended for human occupancy ~~overactive fault traces and strictly regulates construction in the corridors along active faults (e.g., earthquake fault zones).~~ across the trace of active faults and strictly regulates construction in the corridors along active faults (i.e., earthquake fault zones).

CALIFORNIA BUILDING STANDARDS CODE

The California Building Standards Code, or state building code, is codified in title 24 of the California Code of Regulations. The state building code provides standards that must be met to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within the state. The state building code generally applies to all occupancies in California, with modifications adopted in some instances by state agencies or local governing bodies. The current state building code incorporates, by adoption, the International Building Code of the International Code Council, with the California amendments. These amendments include building design and construction criteria that have been tailored for California earthquake conditions.

Chapter 16 of the state building code deals with structural design requirements governing seismically resistant construction (section 1604), including, but not limited to, factors and coefficients used to establish a seismic site class and seismic occupancy category appropriate for the soil/rock at the building location and the proposed building design (sections 1613.5 through 1613.7). Chapter 18 includes, but is not limited to, the requirements for foundation and soil investigations (section 1803); excavation, grading, and fill (section 1804); allowable load-bearing values of soils (section 1806); foundation and retaining walls (section 1807); and foundation support systems (sections 1808 through 1810). Chapter 33 includes, but is not limited to, requirements for safeguards at work sites to ensure stable excavations and cut-and-fill slopes (section 3304) as well as the protection of adjacent properties, including requirements for noticing (section 3307). Appendix J of the state building code includes, but is not limited to, grading requirements for the design of excavation and fill (sections J106 and J107), specifying maximum limits on the slope of cut-and-fill surfaces and other criteria, required setbacks and slope protection for cut-and-fill slopes (J108), and erosion control through the provision of drainage facilities and terracing (sections J109 and J110). San Francisco has adopted Appendix J of the state building code, with amendments to J103, J104, J106, and J109, as articulated in the local building code.

CALIFORNIA DIVISION OF OCCUPATIONAL SAFETY AND HEALTH REGULATIONS.

Construction activities are subject to occupational safety standards for excavation, shoring, and trenching, as specified in California Division of Occupational Safety and Health regulations (Title 8).

SEISMIC HAZARDS MAPPING ACT

The Seismic Hazards Mapping Act of 1990 is intended to reduce damage resulting from earthquakes. Although the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act

With reference to the Alquist-Priolo Act, a structure for human occupancy is defined as one "used or intended for supporting or sheltering any use or occupancy that is expected to have a human occupancy rate of more than 2,000 person-hours per year" (California Code of Regulations, title 14, division 2, section 3601[e]).

(i.e., the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped seismic hazard zones).

LOCAL REGULATIONS AND PLANS ~~TO ADDRESS SEISMIC HAZARDS~~

San Francisco relies on the state and local regulatory review process for review and approval of building permits pursuant to state and local building codes; the building department's implementing procedures, including information sheets; and the Seismic Hazards Mapping Act of 1990 (Public Resources Code sections 2690 to 2699.6). Information Sheet No. S-05 identifies the types of work for which geotechnical reports are required, such as for new construction, building additions, and grading, and report submittal requirements. The building department reviews project construction documents (foundation and structural addenda to the site permit) for conformance with the recommendations in project-specific geotechnical report(s) during its review of the building permit for the project and may require additional site-specific soils report(s) through the building permit application process.

SAN FRANCISCO BUILDING CODE

The San Francisco Building Code is the state building code plus local amendments, including administrative bulletins, local permit processes, and identification of slope protection areas. The San Francisco Building Code is updated on a regular three-year cycle following the update to the state building code.

STRUCTURAL, GEOTECHNICAL, AND SEISMIC HAZARD ENGINEERING DESIGN REVIEW

Building department Administrative Bulletin No. 82 (AB-082) is part of the local building code that provides guidelines and procedures for structural, geotechnical, and seismic hazard engineering design review by qualified state-licensed engineers. AB-082 also specifies the criteria for determining whether the building department will require independent peer review related to the structural and geotechnical design of a proposed project and the other aspects related to seismic hazards.

BUILDINGS 160 FEET IN HEIGHT OR TALLER

Building department Administrative Bulletin No. 083 (AB-083) presents requirements and guidelines for seismic structural design and submittal documents for building permits for new tall buildings that are 160 feet in height that use non-prescriptive seismic design procedures. A non-prescriptive seismic design is one that takes exception to one or more of the prescriptive (traditional/strictly code-conforming) requirements of the San Francisco Building Code related to seismic design by invoking Sections 104.2.8, 1605.2, and/or 1629.10.1 of the San Francisco Building Code, which permit alternative (i.e., non-prescriptive) seismic design procedures. The building department intends that buildings designed to the requirements and guidelines of AB-083 have seismic performance at least equivalent to that intended of code-prescriptive seismic designs consistent with the San Francisco Building Code. To demonstrate that a building design is capable of

San Francisco Department of Building Inspection, Administrative Bulletin AB-083, Requirements and Guidelines for the Seismic Design of New Tall Buildings using Non-Prescriptive Seismic-Design Procedures, March 25, 2008 (Updated 01/01/2020 for code references). Available at https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-95298.

AB-082 provides the overall requirements for structural and geotechnical review procedures and guidance, but if a project request an exception to provisions in the building code, those projects must follow the requirements in AB-083, for buildings taller than 160 feet tall, or AB-111, for buildings taller than 240 feet tall.

providing code-equivalent seismic performance, a three-step procedure involving structural design review, submittal requirements, and seismic design requirements to demonstrate acceptable seismic performance for moderate earthquakes is required.

BUILDINGS 240 FEET IN HEIGHT OR TALLER

Building department Administrative Bulletin No. 111 (AB-111) presents requirements and guidelines for developing a geotechnical site investigation program and preparing geotechnical reports for foundation design and construction of buildings greater than 240 feet in height.

Geotechnical engineering design review is mandatory for structures 240 feet or taller and subject to AB-111. In addition to requirements in this bulletin, the procedures and guidelines for that review must also meet the requirements of AB-082. Per AB-082:

> "If the director determines that review is required, the director shall request one or more Structural, Geotechnical, or Seismic Hazard reviewers having specialized knowledge and experience to provide their professional opinion on identified aspects of a project. The purpose of the review is to provide an independent, objective, technical review of those aspects of the project design that are identified in the scope of the review. The director shall require review for projects where review is required by the San Francisco Building Code. The director may require review for other projects at the director's discretion."

Per AB-111, the geotechnical member(s) of the Engineering Design Review Team (EDRT) shall participate in the Early Site Permit phase of the project to review the Geotechnical Engineer of Record's plan for geotechnical site investigations and the Geotechnical Engineer of Record's geotechnical basis-of-design document. The EDRT ensures that development projects comply with design guidelines prior to permit or entitlement approvals. During the subsequent design review, the EDRT must use the guidelines outlined in the AB-111 bulletin to review the geotechnical report prepared for foundation design and construction. At the conclusion of the review, the geotechnical members of the EDRT must determine in writing that the geotechnical site investigation plan and geotechnical reports meet the requirements of the San Francisco Building Code and AB-111.

Project submittal documents must be in accordance with the San Francisco Building Code and the building department's interpretations, Administrative Bulletins, and policies. In addition, documents relevant to the Geotechnical Analysis and Recommendations and Structural Design Review (including the type of foundation) shall be submitted by the Engineer of Record to the Director and to the geotechnical members of the EDRT.

In coordination with the project architect and structural engineer of record, the following information (if available at the time of preparation of the geotechnical report) should be provided: The project description; a site location map; height of the structure; number of stories; number of basement levels; lateral and gravity loads resisting systems; anticipated gravity foundation loads or bearing pressures;

San Francisco Department of Building Inspection, Administrative Bulletin AB-111, Guidelines for Preparation of Geotechnical and Earthquake Ground Motion Reports for Foundation Design and Construction of Tall Buildings, June 15, 2020. Available at https://sfdbi.org/sites/default/files/AB-111%20dated%2006-15-2020.pdf.

San Francisco Department of Building Inspection, Administrative Bulletin AB-111, Guidelines for Preparation of Geotechnical and Earthquake Ground Motion Reports for Foundation Design and Construction of Tall Buildings, June 15, 2020. Available at https://sfdbi.org/sites/default/files/AB-111%20dated%2006-15-2020.pdf.

applicable codes and design guidelines for seismic design of the building; description of the energy dissipation system (if used); and the approach for development of design ground motions.

The following topics are addressed in AB-111 and should be addressed in the geotechnical report: site surface conditions; regional and local geology' seismicity; field Investigation and laboratory testing; subsurface conditions; foundation and geotechnical earthquake engineering studies, including Code-based site classification, ground-motion and seismic ground deformation characterization (including seismic slope stability and soil liquefaction hazards, as appropriate; settlement analysis (including shallow and deep foundations); sea level rise; static and seismic design of basement walls; foundation support (including shallow foundations and deep foundations such as driven concrete and steel piles, augered cast-in-place piles, and drilled shafts); shoring, dewatering, excavation and underpinning systems; and instrumentation and construction monitoring (including selection of instrumentation and monitoring requirements, pre-construction monitoring, and reporting). The site dewatering should be designed by an experienced dewatering designer and implemented by an experienced dewatering contractor to reduce potential for settlement outside the excavation, relative to the baseline groundwater elevation established prior to excavation. The dewatering system design should incorporate the design parameters (soil and groundwater pressure) provided by the geotechnical consultant.

The geotechnical report should also address the effects of construction on adjacent buildings, notably where ground improvements or new foundations extend below the foundation of the adjacent buildings; the potential of loss of ground and displacements due to construction of large-diameter drilled shafts installed deeper than the foundation of an adjacent buildings; the impact of installation of deep foundations on previously installed foundations; the potential impact of ground-surface heave or vibrations on adjacent structures and improvements; and the effect of construction on the groundwater level inside and outside of the construction area.

Prior to completion of all new tall building projects where the building would be supported on a shallow foundation (not bearing directly on bedrock), the project sponsor must contract with qualified surveyors and instrumentation engineers to monitor the settlement of the building annually for a 10-year period. Should the settlement monitoring data exceed the geotechnical engineer's estimated time rate of settlement, the project sponsor must notify the building department and bring this condition to the building department's attention for immediate additional investigation.

MANDATORY INTERDEPARTMENTAL PROJECT REVIEW

Projects that involve new construction of a building eight stories or more, new construction in a seismic hazard zone for liquefaction hazard, or new construction in a seismic hazard zone for landslide hazard are subject to a mandatory interdepartmental project review prior to a public hearing before the planning commission or the issuance of the new construction building permit. The interdepartmental review meeting must include representatives from the planning, building, public works, and fire departments to address compliance with applicable codes, and design and project construction considerations. The interdepartmental review meeting for the proposed project occurred on **DATE**.

SAN FRANCISCO PUBLIC WORKS CODE

ARTICLE 4.1

Groundwater encountered during construction of the proposed project would be subject to the requirements of Public Works Code article 4.1 (Sewer Use Ordinance) which requires groundwater meet specified water quality standards before it may be discharged into the sewer system.

In addition, Public Works Code article 4.1 also specifies requirements for batch wastewater discharge permits. Such temporary, or "batch" discharges may result from dewatering of construction sites, wells drilled to investigate or mitigate a contaminated site, water used for cleaning or hydrostatic testing of pipes or tanks, or any other activity that generates wastewater, other than from industrial processes. As part of these permits, the permit applicants shall submit analytical results for specified pollutants. Contractors need to obtain a dewatering and discharge permit from the San Francisco Public Utility Commission (SFPUC) for discharging water into the local combined sewer system when dewatering at a construction site is used.

SAN FRANCISCO SUBDIVISION CODE

Section 1358, Preliminary Soils Report, of the San Francisco Subdivision Code requires developers to file soil reports, indicating any soil characteristics that may create hazards and identifying measures to avoid soil hazards and prevent grading from creating unstable slopes. The ordinance requires a state-registered civil engineer to prepare the soils report.

SAN FRANCISCO GENERAL PLAN

The San Francisco General Plan Community Safety Element addresses issues related to geology and soils by providing policies that emphasize public safety from geologic events. The Community Safety Element of the General Plan includes the following policies related to geology and soils:

Objective 1. Reduce structural and non-structural hazards to life safety and minimize property damage resulting from future disasters.

Policy 1.3. Assure that new construction meets current structural and life safety standards.

San Francisco Planning Department. Interdepartmental Project Review. Available at: https://sfplanning.org/resource/interdepartmental-PRV-application

City of San Francisco Planning Department, San Francisco General Plan. https://generalplan.sfplanning.org/. Accessed March 2022.

Policy 1.6. Consider site soils conditions when reviewing projects in areas subject to liquefaction or slope instability.

Policy 1.7. Consider information about geologic hazards whenever City decisions are made that will influence land use, building density, building configurations or infrastructure are made.

3.C.4 Impacts and Mitigation Measures

This section describes the impact analysis related to whether implementation of the proposed project would exacerbate seismic hazards such as liquefaction hazards, lateral spreading, subsidence, among others, leading to loss, injury, or death; be located on an unstable geologic unit or soil; and be located on expansive soil. This section also describes the methods used to determine the impacts of the proposed project and lists the criteria used to conclude whether an impact would be significant. Measures to mitigate significant impacts, if necessary, accompany the discussion of each identified significant impact.

SIGNIFICANCE CRITERIA

The proposed project would have a significant impact if it would:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologists for the area or based on other substantial evidence of a known fault, (Refer to Division of Mines and Geology Special Publication 42)
  - Strong seismic ground shaking,
  - Seismically related ground failure, including liquefaction, or
  - Landslides.
- Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse; or
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

APPROACH TO ANALYSIS

The planning department considers whether a project would be located in an area that is subject to surface fault rupture of a known earthquake fault or strong seismic ground shaking, as mapped by the California Geologic Survey or presented in other substantial evidence. However, in the *California Building Industry Association v. Bay Area Air Quality Management District* case that was decided in 2015, the California Supreme Court held that CEQA does not generally require lead agencies to consider how existing hazards or conditions might affect a project's users or residents, except when the project would exacerbate an existing environmental hazard. Accordingly, hazards resulting from a project that places users of a development in an area subject to surface fault rupture or seismic ground shaking are not considered impacts under CEQA, unless the project would exacerbate a seismic hazard.

2022 PRELIMINARY GEOTECHNICAL REPORT

This section updates the geology and soils analysis presented in the initial study for the previously circulated draft EIR. The previously circulated draft EIR (which includes the initial study) relied on the information and findings of the preliminary geotechnical report prepared by the geotechnical consultant on August 18, 2017. That report preliminarily found that the proposed project could be feasibly constructed on a mat foundation or a deep foundation, pending additional field investigation and analysis as required by the building code and building department requirements.

As described above, in 2020 the geotechnical consultant conducted a further geotechnical investigation at the project site which included drilling two borings to bedrock at the project site, to depths of 250 and 265 feet below site grades; obtaining shear wave velocity data in one of the borings; and performing laboratory tests on representative soil samples. This information was used to perform engineering analyses and develop preliminary conclusions regarding:

- The soil, bedrock, and groundwater conditions at the site.
- The site seismicity and seismic hazards, including potential for fault rupture, ground shaking, and seismically induced settlements.
- The feasible foundation type(s) for the proposed structure.
- The estimates of foundation settlements, including total and differential settlements.
- The feasible shoring and underpinning systems for adjacent structures.
- The 2019 San Francisco Building Code seismic design parameters.
- The site-specific response spectra.
- The construction considerations, including underpinning of adjacent structures, as needed.

The geotechnical consultant incorporated the results of this into the 2022 preliminary geotechnical report for the proposed project. The results of the 2022 preliminary geotechnical report indicate that, on a preliminary basis, a mat foundation a deep foundation are still feasible for the proposed project pending additional field investigation and analysis as required by the building department under AB-111 and AB-082. These feasible foundation systems, and other analysis and recommendations in the 2022 preliminary geotechnical report, are described below.

FEASIBLE FOUNDATIONS

1. **Mat Foundation:** The results of the 2022 preliminary geotechnical report indicate a mat foundation is feasible for the support of the proposed structure. The geotechnical consultant recommends a mat foundation as feasible. The mat foundation would bear on the Colma Formation, which is generally dense to very dense and is generally strong and relatively

Additional field investigation would include the following: drilling a third boring to bedrock, anticipated at a depth of approximately 260 feet, and a fourth boring with a 50-foot rock core, performing a seismic survey to obtain additional shear wave velocity measurements in the boring within the bedrock, performing laboratory testing of additional soil and rock samples, earthquake time series, additional engineering analyses, and recommendations for the foundation and other geotechnical aspects of the proposed project.

incompressible. The geotechnical consultant developed a model to evaluate ground settlement from the anticipated building loads. The anticipated building loads are based on a concrete building structure with three basement levels. The results of the settlement analyses indicate ground settlements between 1 to 2 inches, 50 years after the end of construction at the podium, and 2 to 3.75 inches at the tower portions of the structure. Per AB-111, "the total short-term and long-term computed settlement of the foundation under gravity and seismic loads should not exceed 4 inches". Thus, settlement of less than 4 inches is generally considered acceptable. During the building permit review process, settlement analyses that would incorporate the results of additional field investigation and laboratory testing program are required to confirm the preliminary conclusion. Should the further investigation demonstrate that the total short-term and long-term computed settlement of the foundation under gravity and seismic loads would exceed 4 inches, then the mat foundation would not be feasible and a deep foundation would be necessary.

2. **Deep Foundation:** Deep foundations that extend through the Old Bay Clay into the underlying alluvium and residual soil and/or Franciscan Formation bedrock would be required to support the proposed structure. Large-diameter, drilled cast-in-place piers (also known as drilled shafts) are feasible. Drilled shafts should transfer structural loads to the relatively incompressible sand and clay deposits and/or bedrock below the Old Bay Clay. However, some settlement of the foundations would still occur based on an understanding of the construction material load (concrete) and inclusion of three basement levels. Considering the anticipated drilled shaft lengths and loads, the foundation elements could compress about 1 to 2 inches. Differential settlement of about 1 inch is anticipated between adjacent foundation elements.

SETTLEMENT OUTSIDE OF THE PROPOSED STRUCTURE

Overall, the total anticipated differential settlement at the building interface is on the order of 10 inches and the building design should accommodate this. Exterior slabs, driveways, utilities, and utility connections at the building interface should be designed to accommodate potential differential settlement of up to 10 inches where the improvements settle relative to the building as a result of liquefaction and seismic densification. These exterior features and connections to the building should also accommodate the anticipated static building settlement of up to 2 inches where the building settles relative to exterior improvements. These settlements are expected to occur at different times during the life of the building.

FEASIBLE SHORING SYSTEMS

Construction of the basement and mat will require excavation on the order of about 46 to 52 feet bgs. The excavation will need to be shored, which means implementing a suitable system to support the sides of the excavation until the foundation and basement levels are constructed and protect the surrounding improvements. There are feasible shoring systems to support the two potential foundation systems. These include:

Deep soil mixed (DSM) elements and concrete diaphragm walls. The DSM columns or panels are created by treating soil in place with cement grout. The DSM columns or panels are installed in an overlapping pattern to create a continuous impervious wall. Steel beams are placed in some of the DSM columns or panels to provide rigidity. DSM walls are considered temporary; permanent

walls are built within the shoring. Because these walls are continuous, they will temporarily reduce groundwater infiltration, resulting in the need for less dewatering. To properly reduce groundwater inflow in the excavation, the impervious wall would need to extend at least 30 feet below the bottom of the excavation; the actual embedment below the bottom of the excavation would need to be determined by the shoring/dewatering design engineer.

Concrete diaphragm walls. These are concrete walls constructed by slurry trench method. The walls are constructed in sections or panels. A trench is excavated, then slurry is pumped into and maintained within the trench to prevent the soil from caving. After the excavation reaches the design depth and the reinforcement cage is placed, the slurry is displaced by concrete. One primary difference between concrete diaphragm walls and a DSM wall is that the diaphragm wall is comprised of structural strength concrete and can be used as both temporary shoring and the permanent walls.

Due to the planned excavation depths, the shoring walls will require grouted tiebacks and/or internal bracing for additional lateral support. Tiebacks will require encroachment agreements from adjacent property owners as well as permits from the City of San Francisco. Further information about the feasible shorting systems can be found on Appendix D, page X.

UNDERPINNING

To support the adjacent buildings during excavation, underpinning consisting of slant-drilled piles gaining support in the Colma Formation (below bottom of the excavation) can be used. Underpinning could consist of steel piles installed in slant-drilled shafts (slant piles). Where underpinning is not feasible, the shoring would be designed for the surcharge from adjacent foundations. Further information about underpinning recommendations can be found on Appendix D, page X.

EXCAVATION AND SETTLEMENT MONITORING

The 2022 preliminary geotechnical report provides recommendations for a pre-construction survey and monitoring program consistent with AB-111. The program would be undertaken prior to installation of shoring, excavation, and foundation installation to monitor the effects of these operations. The requirement for a pre-construction survey should be included in the shoring drawings and reviewed by the geotechnical engineer of record. The survey should include documenting the condition of the surrounding structures, including a crack survey, prior to and following construction. The monitoring would provide timely data, which can be used to modify the shoring system if needed. Survey points would be installed on the shoring and on the adjacent streets, buildings, and other improvements that are within 150 feet of the proposed excavation. These points would be used to monitor the vertical and horizontal movements of the shoring and these improvements. These points would be selected with the help of the geotechnical engineer. The monitoring program would also establish a baseline of conditions before starting construction and identify the effects of the construction on the adjacent buildings and improvements. The monitoring program would include survey points, vibration and sound-level monitors, tilt-meters, and crack meters installed in and on adjacent structures, and inclinometers to monitor the movement of shoring walls, and piezometers to monitor groundwater levels. A monitoring program is also recommended to establish the baseline pre-

A geotechnical engineer of record is typically responsible for the design and construction phases of a project.

construction groundwater levels at the site for a period of at least twelve months to capture seasonal fluctuations in groundwater.

Pre-construction documentation and a monitoring program are standard practice, and as stated in chapter 2, Project Description, the project sponsor proposes to implement these recommendations and standard practices.

GROUNDWATER AND DEWATERING

Groundwater in the borings drilled on the project site was encountered within 19.5 feet bgs; the high groundwater level can be 16 feet bgs (approximately elevation of 13 feet). An elevation of 13 feet should be assumed as the design groundwater level for preliminary evaluations. For an impervious wall shoring system (such as a secant pile wall or concrete diaphragm wall), the geotechnical consultant anticipates dewatering only within the project site would be required to facilitate excavation for the basement. The dewatering system would need to account for excavation of soil beneath the mat. The use of an impervious shoring system would limit the potential for lowering of the groundwater level outside of the excavation. As required by AB-111, the site dewatering would be designed by an experienced dewatering designer and implemented by an experienced dewatering contractor to reduce potential for settlement outside the excavation, relative to the baseline groundwater elevation established prior to excavation.

The 2022 preliminary geotechnical report was reviewed by the building department, who concurred with the analysis in the report. Per the building department, the foundation system and its acceptable performance according to code requirements would be determined during the vetting of the design by the building department and EDRT during the detail design permitting of the construction plans when additional detailed reports, plans, and calculations are provided.

BUILDING DEPARTMENT REQUIREMENTS FOR ADDITIONAL GEOTECHNICAL AND STRUCTURAL REVIEW AND APPROVAL

As discussed under Section 3.C.2, Regulatory Framework, AB-082 presents guidelines and procedures for structural, geotechnical, and seismic hazard engineering design review of buildings and other structures. Additionally, AB-111 presents requirements and guidelines for developing geotechnical site investigations and preparing design-level geotechnical reports for the foundation design and construction of buildings over 240 feet in height. The proposed project would be approximately 274 feet tall (with an additional 10 feet for rooftop mechanical equipment). Therefore, the proposed project would require a design-level geotechnical report, including additional field investigation, laboratory testing program, and supplemental engineering analyses in accordance with AB-111.

For compliance with AB-111, the geotechnical engineer would prepare a design-level geotechnical report that would include the results of the additional field investigation (drilling a third boring to bedrock, anticipated at a depth of approximately 260 feet, and a fourth boring with a 50-foot rock core, performing a seismic survey to obtain additional shear wave velocity measurements in the boring within the bedrock, performing laboratory testing of additional soil and rock samples), earthquake time series, additional engineering analyses, and recommendations for the foundation and for other

ADD footnote

geotechnical issues relevant to the proposed project. The design-level geotechnical report would be reviewed by geotechnical reviewer(s) who are part of the EDRT assigned to the proposed project by the building department. The EDRT review would be conducted in accordance with the guidelines and requirements in AB-111. At the conclusion of the review, the geotechnical members of the EDRT shall provide a written statement if, in their professional opinion, the geotechnical site-investigation plan and the geotechnical reports (including the engineer of record's geotechnical basis of design document) meet the requirements of the San Francisco Building Code and AB-111.

The additional geotechnical analysis required under AB-111 and independent professional peer review under AB-111 and AB-082 during the building permit review process would determine the foundation system. The building department would conduct its own review of the project's construction documents for conformance with the San Francisco Building Code and the geotechnical engineer's recommendations as deemed acceptable by the structural and geotechnical peer review process. Given the 2022 preliminary geotechnical report indicates two feasible foundation systems, the analysis in this recirculated draft EIR considers the potential physical environmental impacts of both possible foundation systems.

IMPACT EVALUATION

Impact GE-1: The proposed project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismically related ground failure, liquefaction, or landslides. *(Less than Significant)*

FAULT RUPTURE

Ground rupture is the visible breaking and displacement of the earth's surface along the trace of a fault during an earthquake. The project site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the project site. The San Andreas, Hayward, and San Gregorio faults are the closest major faults to the project site. The San Andreas, Hayward, and San Gregorio faults are designated under the Alquist-Priolo Earthquake Fault Zoning Act and located approximately 8.3 miles southwest, 10.8 miles east, and 11.2 miles west of the project site, respectively. Therefore, no active faults with potential for surface fault rupture are known to pass directly beneath the project site, and the potential for damage to structures at the project site is low. The proposed project would not exacerbate existing conditions by bringing people or structures into areas potentially susceptible to substantial effects, including fault rupture, which could result in substantial damage to proposed structures or infrastructure, or expose people to substantial risk of injury. Impacts associated with surface rupture from a known earthquake fault would be less than significant. No mitigation measures are required.

~~There are no known active or potentially active faults crossing the project site and the project site is not located within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act. Therefore, the potential for fault rupture to occur at the project site is low and therefore the proposed project would not increase any risk associated with fault rupture. Thus, this impact would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.

SEISMIC GROUND SHAKING

The project site is in a seismically active region, and is expected to experience strong ground shaking during the design life of the proposed project. The seismicity of the project site is predominantly governed by the activity of the San Andreas and Hayward faults. However, ground shaking from future earthquakes on any of the nearby faults could be experienced at the project site. In accordance with the San Francisco Building Code, the 2022 preliminary geotechnical report conducted a Probabilistic Seismic Hazard Analysis and deterministic analysis to estimate ground shaking at the project site and determine the appropriate seismic design requirements for the proposed project. Construction of the proposed project would be required to comply with the findings and recommendations of the Probabilistic Seismic Hazard Analysis and deterministic analysis, and the provisions of the San Francisco Building Code and the California Building Code, which includes engineering standards to ensure the foundation and basement of the proposed structure would withstand anticipated ground accelerations at the project site.

As required by AB-111, the proposed project would also be required to prepare a design-level geotechnical report. The design-level geotechnical report would be prepared in accordance with the requirements of AB-082 and address the lateral and gravity loads resisting systems; anticipated gravity foundation loads or bearing pressures; applicable codes and design guidelines for seismic design of the building; description of the energy dissipation system (if used); and the approach for development of design ground motions. The design-level geotechnical report would be reviewed by the EDRT assigned to the proposed project by the building department during the review of the site permit to ensure the seismic design criteria is appropriate for the proposed structure. The building department would review the project's final structural and foundation plans (construction documents) to ensure the proposed project conforms with the measures recommended in the design-level geotechnical report and the recommendations made by the EDRT as required by AB-111 and AB-082. Therefore, compliance with the requirements of the San Francisco Building Code, California Building Code, AB-111, and AB-082, would ensure the proposed project would not exacerbate seismic hazards associated with ground shaking in the event of an earthquake, and impacts would be less than significant. No mitigation measures are required.

~~The project site is located within a 30-mile radius of several major active faults, including the San Andreas (7.5 miles), Hayward (10.6 miles), and San Gregorio (11.2 miles) faults. According to the U.S. Geologic Survey (USGS), the overall probability of a magnitude 6.7 or greater earthquake to occur in the San Francisco Bay Area in the next thirty years is 72 percent. The Preliminary Geotechnical Report estimated strong to very strong shaking is expected to occur during the project's lifetime. The proposed project would be required to comply with the provisions of the San Francisco Building, California Building Code, and the recommendations of the design-level geotechnical study in accordance with section 1803 of the San Francisco Building Code to address impacts from seismic ground shaking.~~

~~In addition, new buildings taller than 240 feet are required to comply with the building department's *Interim Guidelines and Procedures for Structural, Geotechnical, and Seismic Hazard Engineering Design Review for New Tall Buildings* (Information Sheet S-18). The interim guidelines supplement~~

~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~
~~City and County of San Francisco. 2017. Interim Guidelines and Procedures for Structural, Geotechnical, and Seismic Hazard Engineering Design Review for New Tall Buildings (Information Sheet [IS] S-18). Available https://sfdbi.org/sites/default/files/IS%20S-18.pdf. Accessed February 10, 2019.~~

~~and clarify the information in the city's *Guidelines and Procedures for Structural Design Review* (Administrative Bulletin-082), as well as the city's *Requirements and Guidelines for the Seismic Design of New Tall Buildings using Non-Prescriptive Seismic-Design Procedures* (Administrative Bulletin-083). The proposed project would construct a 274-foot-tall building (with an additional 10 feet for rooftop mechanical equipment) and therefore is subject to these guidelines. Compliance with these guidelines would require a peer review of the design-level geotechnical study by an engineering design review team to determine the adequacy of the building's foundation and structural design to support the proposed building. The proposed project would also be required to implement a monitoring program to evaluate settlement at the project site during a 10-year period once the certificate of final completion and occupancy is issued.~~

~~The building department would review the project's final structural and foundation plans (construction documents) to ensure the proposed project conforms with the measures recommended in the site-specific geotechnical reports and the recommendations made by the engineering design review team as required by Information Sheet S-18, Administrative Bulletin-082, and Administrative Bulletin-083. Therefore, the proposed project would not increase risks associated with ground shaking in the event of an earthquake, and impacts would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

LIQUEFACTION AND LATERAL SPREADING

Liquefaction and lateral spreading of soils can occur when ground shaking causes saturated soils to lose strength due to an increase in pore pressure. For substantial lateral spreading displacements to occur, the liquefied soil would consist of saturated cohesionless sediments with penetration resistance, $(N_1)_{60}$, less than 15. According to the 2022 preliminary geotechnical report, soils at the project site had a corrected blow count $(N_1)_{60\text{-}cs}$ value greater than 15, and therefore the soils within the project site have a low potential for lateral spreading.

According to the California Geologic Survey seismic hazard zone map for the City and County of San Francisco, the project site is within a designated liquefaction hazard zone. The 2022 preliminary geotechnical report conducted a liquefaction evaluation in accordance with *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazard Zones in California*, as recommended by the California Geological Survey for sites located within seismic hazard zones. The results of the liquefaction evaluation determined the loose to medium dense Dune sand (extends to depths of 27 to 28 feet bgs) and medium dense clayey sand within the Marsh deposit (extends to depths of 37 to 38 feet bgs), encountered below the design groundwater level, would be susceptible to liquefaction during a major seismic event on a nearby fault. The 2022 preliminary geotechnical report estimated that liquefaction-induced settlement in the Dune sand and Marsh deposit sand could be on the order

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~~San Francisco Building Code. 2008. Guidelines and Procedures for Structural Design Review (Administrative Bulletin-082). Available http://www.gsweventcenter.com/GSW_RTC_References/2008_0325_AB_082.pdf. Accessed February 10, 2019.~~

~~City and County of San Francisco. 2007. Requirements and Guidelines for the Seismic Design of New Tall Buildings using Non-Prescriptive Seismic-Design Procedures (Administrative Bulletin-083). Available https://sfdbi.org/ftp/uploadedfiles/dbi/meeting_information/structural/supporting/2008/AB_083_Draft8.pdf. Accessed February 10, 2019.~~

~~City and County of San Francisco. 2017. Interim Guidelines and Procedures for Structural, Geotechnical, and Seismic Hazard Engineering Design Review for New Tall Buildings (Information Sheet [IS] S-18). Available https://sfdbi.org/sites/default/files/IS%20S-18.pdf. Accessed February 10, 2019.~~

~~Ibid.~~

Youd, T.L., and Idriss, I.M. 2001. *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils*, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 4.

Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.

California Geologic Survey. Earthquake Zones of Required Investigation San Francisco North Quadrangle. Available http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/SAN_FRANCISCO_NORTH_EZRIM.pdf. Accessed February 10, 2019.

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of 2 inches during a Maximum Considered Earthquake Geometric Mean event. However, the proposed project would require excavation to approximately 55 feet bgs and the removal of approximately 55,850 cubic yards of soil, which would remove the potentially-liquefiable soils in their entirety beneath the proposed structure. The potentially-liquefiable soils would be entirely removed from beneath the structure for construction of either the mat foundation or a deep foundation to accommodate the proposed three below grade parking levels. In addition, if a deep foundation is used, drilled shafts would be installed through the Old Bay Clay into the underlying alluvium and residual soil (beginning at approximately 138.5 feet bgs) and/or Franciscan Formation bedrock (beginning at approximately 243 to 249 feet bgs).

Furthermore, construction of the proposed project would be required to comply with the Seismic Hazards Mapping Act and the mandatory provisions of the California Building Code, San Francisco Building Code, AB-082, and AB-111. Compliance with these mandatory provisions requires a design-level geotechnical report to ensure the foundation design and basement of the proposed structure would not be located on soils susceptible to liquefaction. The building department would review the project's structural and foundation plans to ensure they are in conformance with the measures recommended in the design-level geotechnical report and recommendations made by the EDRT as required by AB-082 and AB-111. Therefore, with the removal of the potentially-liquefiable soils as part of the project's proposed excavation to 55 feet bgs to accommodate the three below grade parking levels, and compliance with the requirements of the San Francisco Building Code, California Building Code, AB-082, and AB-111, the proposed project would not exacerbate any risk associated with liquefaction, lateral spreading, or seismic densification, and impacts would be less than significant. No mitigation measures are required.

~~Liquefaction and lateral spreading of soils can occur when ground shaking causes saturated soils to lose strength due to an increase in pore pressure. According to the California Geologic Survey seismic hazard zone map for the City and County of San Francisco, the project site is within a designated liquefaction hazard zone. The preliminary geotechnical report determined the project site is underlain with loose to medium dense sand and the groundwater level is estimated at 15 to 20 feet bgs. The loose to medium dense sand could be susceptible to liquefaction-induced ground settlement and strength loss during a major earthquake. Therefore, the preliminary geotechnical report determined that the potential for liquefaction to occur is high at the project site and up to 2 inches of settlement due to liquefaction could occur. The proposed project would be required to comply with the Seismic Hazards Mapping Act and the mandatory provisions of the California Building Code and San Francisco Building Code. Compliance with these mandatory provisions requires a design-level geotechnical report to evaluate and address the potential for liquefaction and failure-prone soils at the project site. The proposed project would be required to implement the recommendations of the design-level geotechnical report. The building department would review the project's structural and foundation plans to ensure they are in conformance with the measures recommended in the design-level geotechnical reports and recommendations made by the engineering design review team as required by Information Sheet S-18, Administrative Bulletin-082, and Administrative Bulletin-083. Therefore, the proposed project would not increase any risk associated with liquefaction and lateral spreading, and impacts would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

~~California Geologic Survey. Earthquake Zones of Required Investigation San Francisco North Quadrangle. Available http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/SAN_FRANCISCO_NORTH_EZRIM.pdf. Accessed February 10, 2019.~~

~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~

LANDSLIDES

The project site and the surrounding area are relatively ~~flat~~ level with an elevation ranging from 28.5 to 31 feet. ~~Based on the~~ According to the Community Safety Element of the San Francisco General Plan, the project site is not located within a mapped landslide zone. Furthermore, the project site is not within a designated earthquake-induced landslide zone as shown on the California Geological Survey seismic hazard zone map for the area. Therefore, the proposed project would not exacerbate any risk associated with earthquake-induced landslides, and impacts would be less than significant. No mitigation measures are required.

CONCLUSION

In summary, for the reasons stated above, the proposed project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismically related ground failure, liquefaction, or landslides. All impacts would be less than significant and no mitigation measures are required. ~~This topic will not be discussed in the EIR.~~

Impact GE-3: The proposed project would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. ***(Less than Significant)***

According to the 2022 preliminary geotechnical study, the project site is underlain by loose to medium dense sand fill, Dune sand, and marsh deposit, approximately 37 to 38 feet bgs. Beneath the marine deposit (below depths of 37 to 38 feet bgs) is sandy soil with varying clay and silt content, known locally as the Colma Formation. The Colma Formation is underlain by Old Bay Clay to depths of 135 to 138.5 feet bgs, and alluvium/residual soil that extends to the depths of about 243 to 249 feet, which is the top of bedrock. During the 2020 field investigation, groundwater was encountered within 19.5 feet. However, based on historic groundwater levels, past investigations in the vicinity of the site, and to account for seasonal fluctuations and a reasonable consideration for near-future sea level rise, it is estimated groundwater levels could rise to within 16 feet from existing street grades.

The results of the liquefaction evaluation determined the loose to medium dense Dune sand and medium dense clayey sand within the Marsh deposit, encountered below the design groundwater level, are susceptible to liquefaction and seismic densification. However, soil susceptible to liquefaction generally had a corrected blow count value greater than 15, which indicates that the potential for lateral spreading to occur at the project site is low. During excavation activities, the proposed project would encounter groundwater and the loose to medium dense sand could become unstable. Construction of the basement and mat foundation would require an excavation of approximately 55 feet bgs and the removal of approximately 55,850 cubic yards of soil, including all soils susceptible to liquefaction and seismic densification, from the project site. If a deep foundation is required, drilled shafts would be installed through the Old Bay Clay into the underlying alluvium and

San Francisco Planning Department. San Francisco General Plan, Community Safety Element. Available http://generalplan.sfplanning.org/Community_Safety_Element_2012.pdf. Accessed February 10, 2019.
California Department of Conservation, Division of Mines and Geology, November 2000. State of California Seismic Hazard Zones, City and County of San Francisco Official Map. https://sfgov.org/sfc/sites/default/files/ESIP/FileCenter/Documents/10438-California%20Seismic%20Hazard%20Zones%20Map.pdf
Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.
Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.

residual soil (beginning at approximately 138.5 feet bgs) and/or Franciscan Formation bedrock (beginning at approximately 243 to 249 feet bgs). The 2022 preliminary geotechnical report recommends the use of shoring and underpinning during construction activities to support the sides of the excavation and protect the adjacent buildings and other improvements as well as the foundation of the proposed structure. Due to the shallow groundwater level, construction of the proposed project would be required to implement a dewatering system to maintain the water level at the specified depth until the building can resist hydrostatic loads.

The project sponsor is required to implement the final shoring and dewatering systems in accordance with the recommendations of the design-level geotechnical report, and the requirements of San Francisco Building Code, AB-082, and AB-111. Prior to dewatering activities, the project sponsor would be required to notify the SFPUC and obtain a dewatering and discharge permit. Groundwater encountered during construction of the proposed project would be subject to the requirements of Public Works Code article 4.1 (Industrial Waste) which requires groundwater meet specified water quality standards before it may be discharged into the sewer system. Adherence to the requirements of the California Building Code, San Francisco Building Code, AB-082, and AB-111 would address any potential impacts related to unstable soils as part of the design-level geotechnical investigation prepared for the proposed project. The building department would review the project's structural and foundation plans to ensure they are in conformance with the measures recommended in the design-level geotechnical reports and recommendations made by the EDRT as required by AB-082 and AB-111. Therefore, the proposed project would not be constructed on a geologic unit or soil that is unstable or that would result in a substantial risk of loss, injury, or death involving unstable geologic units or soils or onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse, and this impact would be less than significant. No mitigation measures are required.

~~According to the preliminary geotechnical study, the project site is underlain by loose to medium dense sandy fill, native sand, and marsh deposit, approximately 35 to 40 feet bgs, with dense to very dense sand extending below to a depth of at least 80 feet. A 5 to 15 foot thick stiff to hard sand clay layer, locally referred to as old bay clay, may be present below the dense to very dense sand at depths of 80 to 90 feet bgs. Groundwater is anticipated within 15 to 20 feet bgs based on sites in the vicinity of the project site.~~

~~The project site would be excavated approximately 55 feet bgs and 55,850 cubic yards of soil would be removed from the project site for construction of the three-level parking garage. During excavation activities, the loose to medium dense sand could become unstable, potentially causing settlement of adjacent structures and streets. The preliminary geotechnical report recommends the use of shoring and underpinning during construction activities to support the sides of the excavation, adjacent buildings, and foundation of the building. Due to the shallow groundwater level, the preliminary geotechnical report also recommends implementation of a dewatering system to lower the groundwater at least 3 feet below the excavation level. The dewatering system would maintain the water level at the specified depth until the building can resist hydrostatic loads. The project sponsor is required to implement the final shoring and dewatering systems in accordance with the recommendations of the design-level geotechnical report, and the requirements of the California Building Code and San Francisco Building Code. Prior to dewatering activities, the project sponsor is also required to notify the SFPUC and obtain a batch wastewater discharge permit. Groundwater encountered during construction of the proposed project would be subject to the requirements of~~

Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study- 469 Stevenson Street. April 15, 2022.
SFPUC. 2018. Waste Water Discharge Permits. Available https://sfwater.org/index.aspx?page=498. Accessed February 10, 2019.
~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~
~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~
~~SFPUC. 2018. Waste Water Discharge Permits. Available https://sfwater.org/index.aspx?page=498. Accessed February 10, 2019.~~

~~Public Works Code article 4.1 (Industrial Waste) which requires groundwater meet specified water quality standards before it may be discharged into the sewer system.~~

~~Adherence to California and San Francisco Building Code requirements would address any potential impacts related to unstable soils as part of the design-level geotechnical investigation prepared for the proposed project. Furthermore, the building department would review background information, including geotechnical and structural engineering reports, to ensure the suitability of the soils on the project site for development of the proposed project. Therefore, potential impacts related to construction on unstable soils would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

Impact GE-4: The proposed project would not result in a substantial risk of loss, injury, or death related to expansive soils as defined in Table 18-1-B of the Uniform Building Code. *(Less than Significant)*

Expansive soils expand and contract in response to changes in soil moisture, most notably when near surface soils change from saturated to a low-moisture content condition, and back again. This shrinking and swelling can cause cracks in foundations, slabs, and pavement if not properly managed. The results of the borings drilled at the site indicate that only the Old Bay Clay is highly expansive. The excavation for either foundation system would terminate in Colma Sand, which is about 60 to 77.5 feet thick and above the Old Bay Clay. Therefore, the moderate to high expansion potential for Old Bay Clay would not affect the performance of the proposed structure. Additionally, compliance with the requirements of the design-level geotechnical report, California Building Code, San Francisco Building Code, AB-082, and AB-111, would ensure the proposed project would not result in a substantial risk of loss, injury, or death related to expansive soils, and the impact would be less than significant. No mitigation measures are required.

~~The presence of expansive soils is typically based on site-specific data. As discussed in the preliminary geotechnical report, the project site is underlain by loose to medium dense sandy fill, native Dune sand, and marsh deposit, approximately 37 to 38 35 to 40 feet bgs, with dense to very dense sand, known as the Colma Formation, extending below to a depth of 98 to 114.5 feet bgs. at least 80 feet. A 24 to 37 5 to 15 foot thick stiff to hard sand medium stiff to very stiff marine clay layer, locally referred to as old bay clay, may be is present below the dense to very dense sand at depths of 135 to 138.5 feet bgs. 80 to 90 feet bgs The old bay clay, where present, is likely underlain by dense to very dense sand and very stiff to hard clay extending to bedrock. The preliminary geotechnical report estimates bedrock is 200 feet bgs. 243 to 249 feet bgs. Anticipated excavation for the three-level parking garage and foundation is expected to remove the majority of existing loose to medium dense sandy fill, leaving mostly the underlying dense to very dense sand. However, as recommended by the preliminary geotechnical report, the presence of old bay clay at the project site should be confirmed by the design-level geotechnical investigation to determine the potential for expansive soils at the site. The project sponsor is required to complete a design-level geotechnical report and implement its recommendations to address impacts related to expansive soils at the project site in accordance with the San Francisco Building Code. Therefore, impacts related to expansive soils would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~
~~Langan Engineering and Environmental Services, Inc. 2017. Preliminary Geotechnical Study- 469 Stevenson Street. August 18, 2017.~~

CUMULATIVE IMPACTS

Impact C-GE-1: The proposed project, in combination with cumulative projects, would not result in a significant cumulative impact related to geology and soils. *(No Impact)*

The geographic context for cumulative analysis of impacts on geology and soils is generally site-specific and comprises the project site and immediately adjacent properties. The requirements of the San Francisco Building Code and California Building Code regulate construction in the City of San Francisco, and all developments would be required to comply with these requirements to ensure life and safety. The list of cumulative projects is provided in Table 3-1. There are no adjacent cumulative projects that would affect subsurface conditions in the area. In addition, the properties directly adjacent to the project site are known historic resources and are unlikely to undergo substantial redevelopment; no reasonably foreseeable projects are associated with those properties. Thus, the proposed project could not combine with cumulative projects to result in a cumulative impact related to geology, soils, and seismicity. There would be no impact, and no mitigation measures are required.

~~The geographic context for cumulative analysis of impacts on geology and soils is generally site-specific and comprises the project site and immediately adjacent properties. Reasonably foreseeable cumulative projects could require various levels of excavation or cut-and-fill, which could affect local geologic conditions. The building code regulates construction in the City of San Francisco, and all development projects would be required to comply with its requirements to ensure maximum feasible seismic safety and minimize geologic impacts. Site-specific measures identified in project-specific geotechnical reports would be implemented as site conditions warrant to reduce any potential impacts from unstable soils, ground shaking, liquefaction, or lateral spreading.~~

~~The project would entail excavation to a depth of approximately 55 feet bgs and remove approximately 55,850 cubic yards of soil from the project site to construct the three-level parking garage. The proposed project would require shoring and underpinning during construction activities to support the sides of the excavation, adjacent buildings, and foundation of the building. The proposed project would also require a dewatering system and obtain a batch wastewater discharge permit from SFPUC. The project sponsor would be required to implement the final shoring and dewatering systems in accordance with the recommendations of the design-level geotechnical report, and the requirements of the California Building Code and San Francisco Building Code. The development projects listed in Table 2 would all be subject to the same seismic safety standards and design review procedures applicable to the proposed project. Compliance with the seismic safety standards and the design review procedures would ensure that the effects from nearby cumulative projects would be reduced to less-than-significant levels. As such, cumulative impacts related to geology and soils would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

~~Like the proposed project, all reasonably foreseeable cumulative projects that would disturb more than 5,000 square feet of land are required to prepare and implement an erosion and sediment control plan pursuant to the Construction Site Run-off Ordinance. Therefore, cumulative impacts related to soil erosion would be less than significant. No mitigation measures are required. This topic will not be discussed in the EIR.~~

~~Paleontological impacts are generally site specific and highly localized. Therefore, the potential for the proposed project to combine with reasonably foreseeable cumulative projects to create a cumulative impact related to paleontological resources would be low. For these reasons, the proposed project, in~~

~~combination with reasonably foreseeable future projects, would have less-than-significant cumulative paleontological resource impacts. This topic will not be discussed in the EIR.~~