East Bay Municipal Utility District

Wildcat Pumping Plant Project
Final Noise Technical Report

June 2021

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PANORAMA
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Final Noise Technical Report

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1 Introduction

1.1 Project Overview

The East Bay Municipal Utility District (EBMUD) is proposing to construct a new Wildcat Pumping Plant (PP) at EBMUD's existing Road 20 Rate Control Station (RCS) site in the City of San Pablo in Contra Costa County (Figure 1 and Figure 2). The Wildcat PP would replace the existing Road 20 Portable PP (approximately 10-million-gallon-per-day [mgd] capacity). The Wildcat PP Project (project) is necessary to improve the reliability of water service to major portions of the Aqueduct Pressure Zone (PZ) and to provide transmission capacity south from the Sobrante Water Treatment Plant (WTP) during Orinda WTP, Claremont Tunnel, and Wildcat Aqueduct planned and unpanned outages that could occur due to maintenance and inspection or emergency shutdowns. Although the existing Road 20 Portable PP and San Pablo WTP have been providing service in the event of outages, the Road 20 Portable PP is a temporary facility that cannot meet all the demands in the Aqueduct PZ and upper cascades, and the San Pablo WTP is an aging facility that is planned to be decommissioned. The project will also allow EBMUD to distribute water that is stored in San Pablo Reservoir and treated at Sobrante WTP to EBMUD's West of Hills service area, particularly in drought years.

The project includes the following primary components:

- Construction of a new 25-mgd PP (shown on Figure 3) at the existing Road 20 RCS site at the intersection of El Portal Drive and Road 20 in the City of San Pablo;
- Replacement of a 4-inch slow-venting air valve near 1303 Walnut Street in the City of Berkeley and installation of a new 2-inch slow-venting air valve at Crockett PP, west of San Pablo Avenue at Robert Miller Drive in the City of San Pablo;
- Construction of an onsite stormwater drainage system that would connect to a new manhole and storm drain pipeline on El Portal Drive, which would extend westerly for approximately 725 feet before connecting to an existing curb inlet on the south side of Road 20; and
- Construction of approximately 170 feet of new 36-inch-diameter suction and discharge pipelines, which would be installed on site to connect the new Wildcat PP to the existing Wildcat Aqueduct.

The Wildcat PP would consist of four approximately 8-mgd variable frequency drive pumps (for a total capacity of 25 mgd) and associated mechanical and electrical equipment located inside an approximately 40-foot-wide, 80-foot-long, and 24-foot-tall building. The site will be

enclosed by an eight-foot-high, black-vinyl coated security chain link fence on all sides with the exception of the south and southeastern sides where an eight-foot-high concrete masonry unit (CMU) wall topped with barbed wires will be installed in place of the chain link fence. The Wildcat PP would include an approximate 25-foot-tall antenna (from the ground floor), outdoor light fixtures; site access double swing gates; a parking area; outdoor transformer and switchgear; auto-transfer switch; generator control panel; and staging areas for a temporary emergency generator, portable diesel tank, and portable PP. The existing Road 20 Portable PP will be removed from the project site after the project is constructed. However, the existing portable pump connections will remain for emergencies and planned outages of the Wildcat PP. The project would also include building architectural and landscape treatments, as well as stormwater bioretention features, as described in the *East Bay Municipal Utility District Wildcat Pumping Plant Project Aesthetics Conceptual Design Report* (Panorama Environmental, Inc., MWA Architects, and Dillingham Associates, 2021).

Figure 1 Regional Location

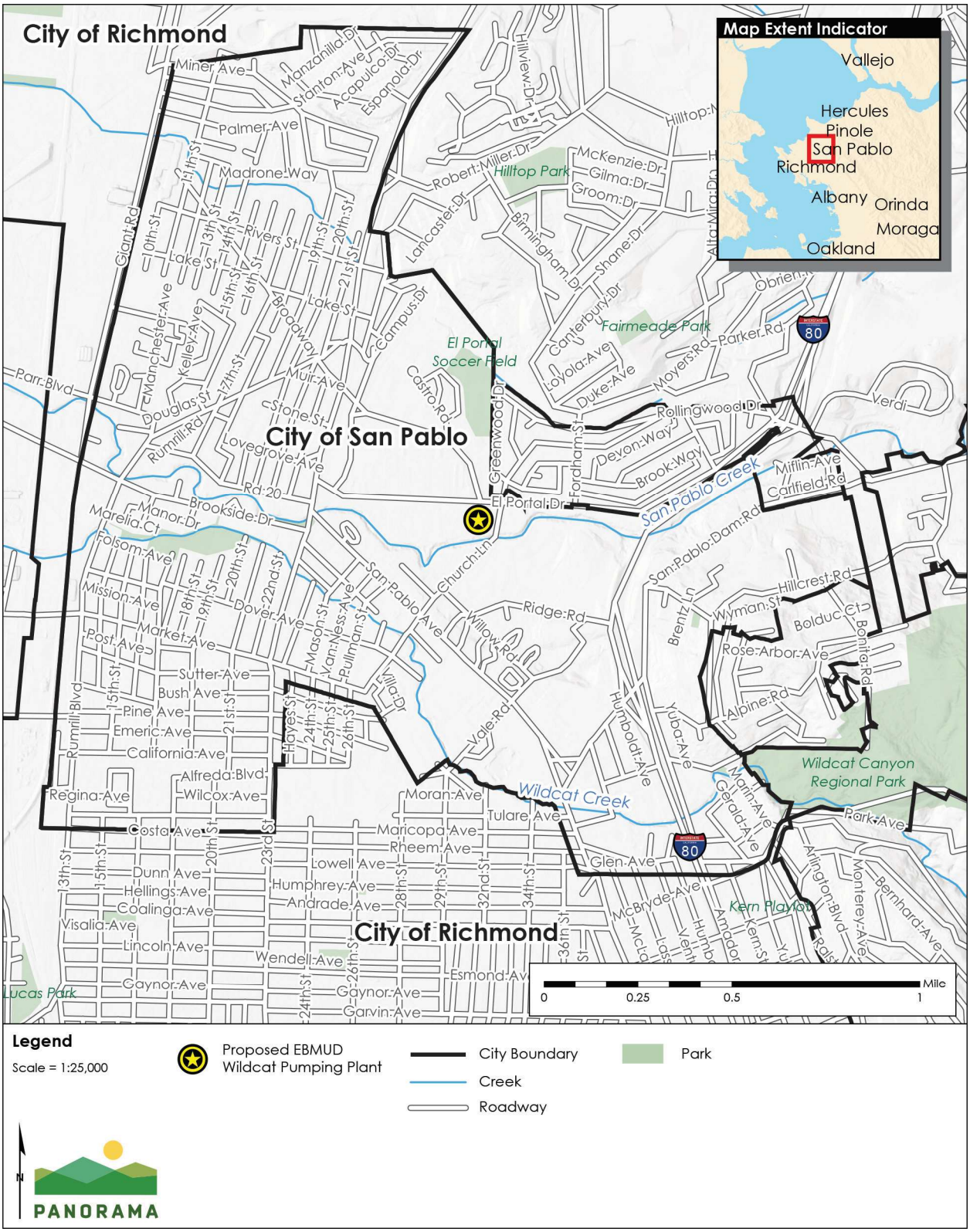
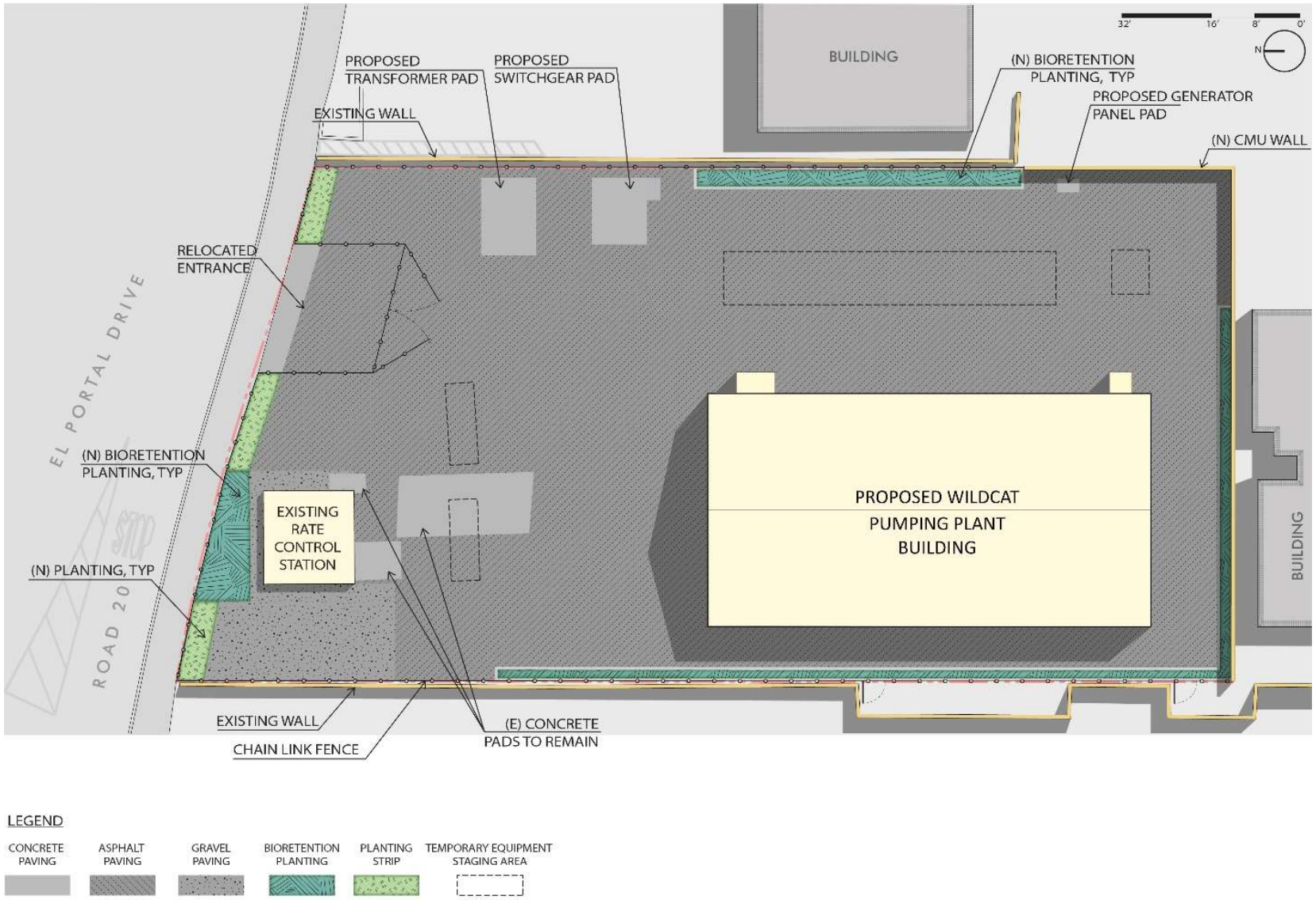


Figure 2 Wildcat Pumping Plant Site and Road 20 Storm Drain Pipeline Alignment

Figure 3 Proposed Wildcat Pumping Plant



Source: (EBMUD, 2021)

1.2 Definitions

1.2.1 Noise

Noise is defined as unwanted sound. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Most of the sounds that we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extremely high frequencies, than in the frequency mid-range. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 1 for different types of noise. A 10 dBA increase in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented in this section are expressed in terms of dBA unless otherwise indicated.

Table 1 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**70 dBA**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**60 dBA**	
		Large business office
Quiet urban daytime	**50 dBA**	Dishwasher in next room
Quiet urban nighttime	**40 dBA**	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Noise Descriptors

To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01}, L_{10}, L_{50}, and L_{90}, are commonly used, which correspond to the A-weighted noise levels equaled or exceeded during one percent, 10 percent, 50 percent, and 90 percent of a specified time period, respectively. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a specified period of time and will be the primary descriptor used in the analysis. L_{max} and L_{min} will also be used, which represent the maximum and minimum A-weighted noise level during the measurement period, respectively.

Human sensitivity to noise increases during the evening and nighttime hours because excessive noise interferes with the ability to sleep. Two 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Day/Night Average Sound Level (DNL or Ldn) is a measure of the cumulative noise exposure in a community, with a 10 dB addition to nocturnal (10 p.m. - 7 a.m.) noise levels.[1] The Community Noise Equivalent Level (CNEL) is a 24-hour weighted average that, like L_{dn}, adds a 10 dBA "penalty" to noise events between 10:00 p.m. and 7:00 a.m.. CNEL also adds a 4.77 dBA penalty to noise events during evening hours (7:00 p.m. to 10:00 p.m.) (FAA, 2018). CNEL is used to define the threshold for excessive exposure to aircraft noise (refer to Section **Error! Reference source not found.**).

Noise Attenuation

Attenuation describes the rate at which noise decreases over distance. Attenuation rates are affected by topography, ground absorption, and intervening structures.

Most noise sources can be classified as either point sources, such as stationary equipment, or line sources, such as a roadway. Sound generated by a point source (i.e., construction equipment) attenuates at an approximate rate of 6 dBA for each doubling of distance away from the source. For example, a 60-dBA noise level measured at 50 feet from a point source would be approximately 54 dBA at 100 feet from the source and 48 dBA at 200 feet from the source. Noise from a line source (i.e., roadways) attenuates at approximately 3 to 4.5 dBA[2] per doubling of distance **Invalid source specified.**.

1.2.2 Vibration

Vibration caused by construction activities can be interpreted as energy transmitted in waves through the ground. Vibration attenuates as a function of the distance between the source and

---

[1] In general, L_{dn} is equivalent to $L_{eq}(24)$ with a 10 dB penalty applied to nighttime hours (between 10:00 p.m. and 7:00 a.m.). However, if a project does not generate nighttime noise between 10:00 p.m. and 7:00 a.m., no 10-dB penalty is applied and L_{dn} is directly equivalent to $L_{eq}(24)$.

[2] A 3-dBA reduction is typically attributed to noise attenuation over hard surfaces, such as concrete or asphalt. A 4.5-dBA reduction is typically attributed to noise attenuation over soft surfaces, such as residential yards or areas with vegetation.

receptor. Vibration emanating from a single location (a "point source") attenuates at a rate of approximately 50 percent for each doubling of distance from the source (termed the "inverse square law") which tends to underestimate attenuation and, therefore, provides a "worst-case" estimate of vibration at the receptor.

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is used to assess the potential for damage to buildings and structures, and annoyance, and is expressed in inches per second (in/sec).

Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration.

1.2.3 Sensitive Noise Receptors

Human response to noise varies considerably from one individual to another. The effects of noise can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these noise effects, some land uses are considered more sensitive to noise levels than others. In general, residences, schools, hospitals, and nursing homes are considered sensitive noise receptors and the most sensitive to noise.

2 Environmental Setting

2.1 Noise Conditions

The existing noise environment at receptors in the vicinity of the Wildcat PP is typical of urban residential neighborhoods and commercial areas and consists primarily of local traffic noise.

The City of San Pablo provides noise environment context for areas within the city limits in the *San Pablo General Plan 2030, Section 3.9 Noise* (City of San Pablo, 2011). According to the San Pablo General Plan (General Plan):

> *"The major sources of noise in San Pablo are related to vehicular traffic, including automobile and truck traffic on arterial roads and Interstate 80, and rail operations along Giant Road. Schools, industrial areas and construction sites may also generate noises during the day."*

The General Plan also provides motor vehicle noise contour maps (General Plan, *Figure 9-5 Existing Noise Contours* [Year 2010] and *Figure 9-6 Future Noise Contours* [Year 2030]) that cover areas within the city limits along its major arterial roadways and Interstate 80. Traffic noise levels are presented in L_{dn} and are shown as color-coded bands along the major arterials. In the vicinity of the project, these mapped arterial roadways include El Portal Drive, Road 20, and Church Lane, including the segments of these roadways nearest the project site. According to the noise contour maps, both the existing and future (2030) noise exposure are 65 to 70 dBA L_{dn} for land uses adjacent/close to the segments of El Portal Drive and Church Lane and 60 to 65 dBA L_{dn} for land uses adjacent/close to the segment of Road 20 extending west of project site.

2.1.1 Noise Measurements and Results

Noise specialist staff from Panorama Environmental, Inc. conducted site visits on February 17 and March 4, 2021. During the site visits, on-site conditions were verified, noise levels generated by existing nearby noise sources and equipment were monitored, and site-specific ambient noise data was independently developed to verify the current accuracy of the ambient noise data from the General Plan.

During the surveys, short-term (i.e., 10 to 15 minute duration) noise measurements were made with an Extech SDL600 Sound Level Meter (an ANSI-certified, Type II Survey meter) at four locations on and around the project site, as shown in Figure 4. Because vehicle traffic is the dominant noise source in most of San Pablo (according to the General Plan and as was observed during the site visit), the measurement times were chosen to fall within the period of peak evening traffic volumes (typically weekdays from 4 p.m. to 6 p.m.). The measurement locations were selected to sample peak-hourly traffic noise levels at locations very close to curbside fronting El Portal Drive and Church Lane (ST-1 and ST-4, respectively) and to sample peak-

hourly traffic noise levels at the setbacks of the closest existing residences (Kona Apartments) facing El Portal Drive and Church Lane (ST-2 and ST-3, respectively). The measured noise levels are presented in Table 2, along with a summary of survey notes relating to observed local noise sources.

Due to the COVID-19 pandemic, traffic volumes in 2020 had significantly decreased, resulting in atypical and non-representative traffic noise levels in the project area. Prior to visiting the project site, consideration was given as to whether the local noise levels measured during the project site survey should be adjusted upwards to better approximate the higher noise levels (due to the higher traffic volumes) prior to shelter-in-place restrictions imposed in March 2020. Although Walter T. Helms Middle School remains closed, observations during the site visit indicated that all local business in the El Portal Drive/Church Lane intersection vicinity were open and/or operational. Therefore, it is assumed that current noise conditions would not substantially differ from noise levels prior to shelter-in-place restrictions. To verify that measured noise levels were representative of noise levels prior to shelter-in-place restrictions, the measured noise levels were compared to the noise contours included in the San Pablo General Plan. The General Plan presents noise contours using L_{dn}. The Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment, Appendix D – Determining Existing Noise* finds that L_{dn} can be accurately extrapolated from L_{eq} (peak hour) using the following equation:

$$Ldn = Leq(peak\text{-}hour) - 2\ dBA$$

Thus, the noise measurements near El Portal Drive and Church Lane, when adjusted downward by 2 dBA, would fall within the same 65 to 70 dBA L_{dn} range as presented for El Portal Drive and Church Lane in the General Plan contour maps, confirming that noise measured noise levels are representative of more typical noise levels. Therefore, noise modeling to account for typical traffic volumes was not warranted for the purposes of this analysis.

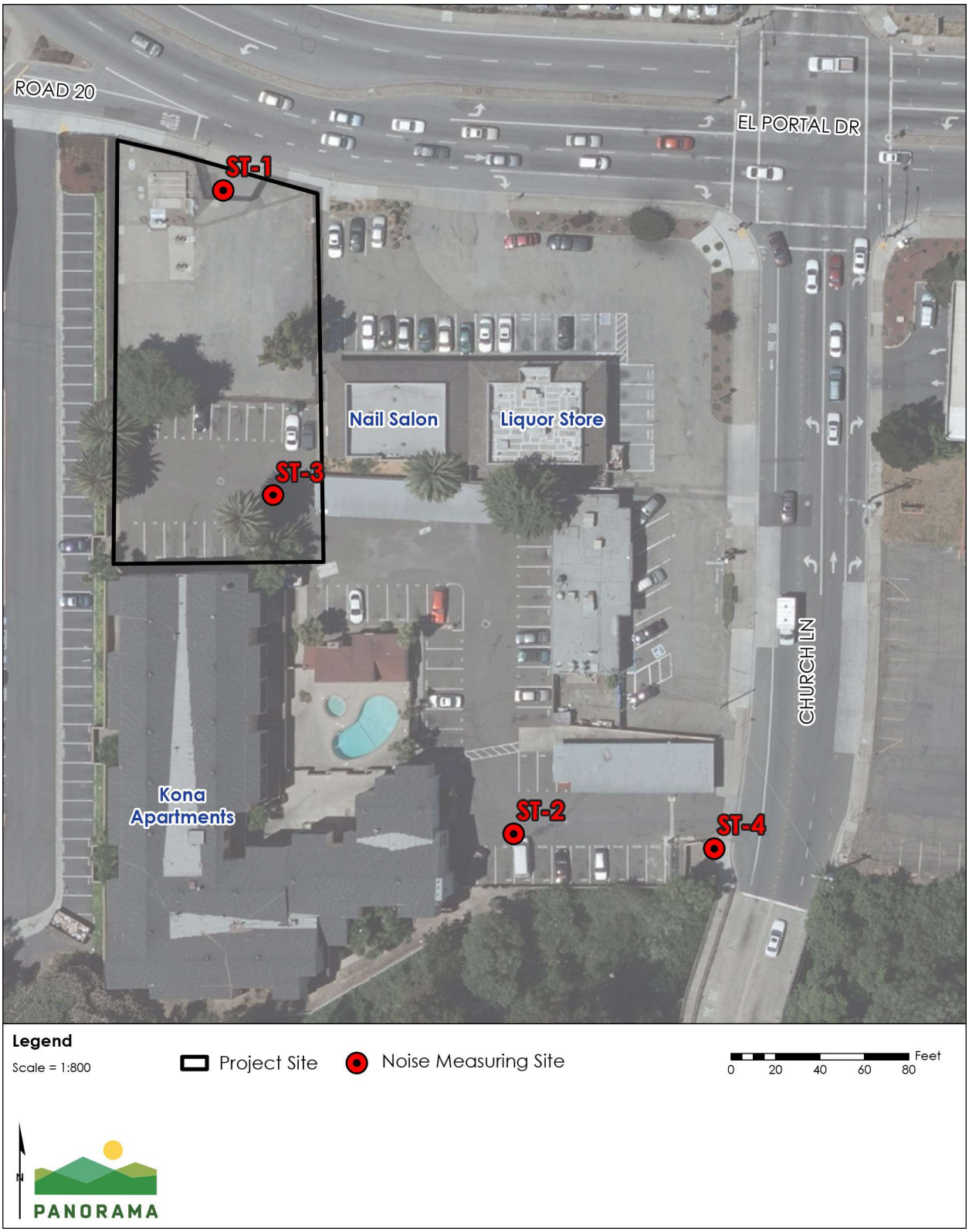
Table 2 Short-Term Activity/Ambient Noise Measurement Data (dBA)

Measurement Location	L_{min}	L_{90}	L_{eq}	L_{10}	L_{max}	Observations during Measurement Period
ST-1 Fronting El Portal/Road 20 – entrance to project site (15 feet from curb) Begin: 16:40; 2/17/21	52.4	57.2	67.1	68.9	84.1	Traffic is the only notable noise source. Peak noise events were produced by vehicles traveling over the speed limit or accelerating after traffic signal change.
ST-2 Facing Church Lane – Kona Apt southeast parking lot (130 feet from curb) Begin: 17:00; 3/4/21	48.1	52.3	57.7	60.1	66.2	Traffic noise level is substantially less due to greater distance from the roadway. Peak noise events were produced by vehicle passbys.
ST-3 Facing El Portal/Road 20 – Kona Apt northwest parking lot (150 feet from curb) Begin: 16:40; 3/4/21	45.0	49.6	55.4	57.6	66.4	Traffic noise level is substantially less due to greater distance from roadways and blockage by intervening structures. Peak noise events were produced by vehicle start-ups and movement in the immediate parking lot.
ST-4 Fronting Church Lane – entrance to Kona Apt southeast parking lot (6 feet from curb) Begin: 17:10; 3/4/21	51.1	59.6	68.8	72.1	80.6	Traffic is the only notable noise source. Frequent peak noise events were produced as vehicles passed the meter, most traveling at/over speed limit.

[a] The **decibel (dB)** is the standard measure of a sound's loudness relative to the human threshold of perception. Decibels are said to be **A-weighted (dBA)** when corrections are made to a sound's frequency components during a measurement to reflect the known, varying sensitivity of the human ear to different frequencies. The **Equivalent Sound Level (L_{eq})** is a constant sound level that carries the same sound energy as the actual time-varying sound over the measurement period. **Statistical Sound Levels—L_{min}, L_{90}, L_{10} and L_{max}**—are the minimum sound level, the sound level exceeded 90 percent of the time, the sound level exceeded 10 percent of the time and the maximum sound level, respectively, during the measurement period.

[b] All recorded measurement periods were 10 to 15 minute durations between 4:00 p.m. and 6:00 p.m.

Figure 4 Noise Measurement Locations



2.2 Sensitive Receptors Near Project Site

No noise-sensitive uses occur on the project site itself; however, adjacent and nearby noise-sensitive uses include residences and a school. Noise-sensitive receptors within 1,000 feet[3] of the Wildcat PP site and Road 20 storm drain pipeline alignment are identified in Table 3 and shown in

Figure 5.

Table 3 Noise-Sensitive Receptors within 1,000 Feet of the Project

Receptor	Location Relative to Project Site
Pumping Plant Site	
Kona Apartments (Multifamily Residential Apartment Building)	Adjacent to the Wildcat PP site; structures as close as approximately 20 feet south of the pumping plant site
Walter T. Helms Middle School	Adjacent to the Wildcat PP site; structures as close as approximately 50 feet west of the pumping plant site [a]
Rancho San Pablo Residential Complex	Approximately 115 feet north of the pumping plant site, across El Portal Drive [b]
Rock Harbor Christian Fellowship	Approximately 300 feet east of the pumping plant site [c]
Rollingwood Lutheran Church	Approximately 450 feet northeast of the pumping plant site [c]
Other Residences (numerous residences)	Occurring as close as 320 feet from the pumping plant site
Road 20 Storm Drain Pipeline Alignment	
Abella Residential Complex	Structures as close as approximately 60 feet north of the storm drain pipeline in Road 20 [d]
Walter T. Helms Middle School	Structures as close as approximately 25 feet south of the storm drain pipeline in Road 20
Other Residences (numerous residences)	Occurring as close as 320 feet from the storm drain pipeline in Road 20

Notes

[a] A 6-foot-high concrete wall exists along the entire Walter T. Helms School east property line.

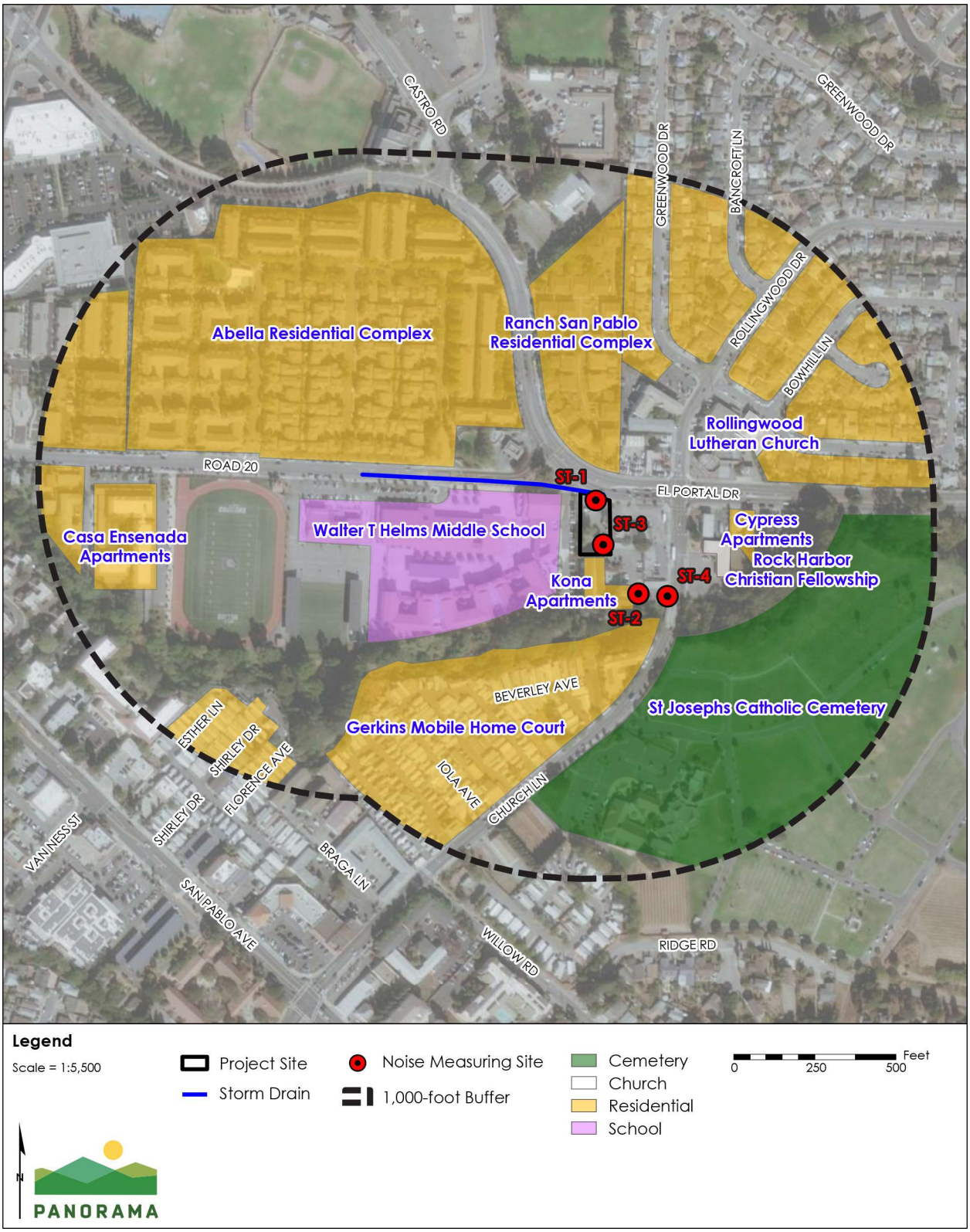
[b] A 6-foot-high concrete wall fronting El Portal Drive exists along the Rancho San Pablo residential development's southern boundary.

[c] Places of worship are identified in this table because they considered sensitive land uses by the City of San Pablo; however, construction is not planned for weekends when regular services occur.

[d] A 6-foot-high concrete wall fronting Road 20 exists along the Abella residential development's southern boundary.

[3] The industry standard for identification of noise-sensitive receptors is 1,000 feet from noise generating activities unless excessive noise-generating equipment, such as pile drivers, are used.

Figure 5 Sensitive Receptors



3 Regulatory Setting

3.1 Federal and State Regulations

No federal or state standards related to noise are applicable to the proposed project. The Federal Noise Control Act of 1972 divides powers between federal, state, and local governments, in which the primary federal responsibility is for noise source emission control. State and local governments are responsible for controlling the use of noise sources and determining the levels of noise to be permitted in their environments (42 U.S. Code, Chapter 65: Noise Control).

3.2 Local Regulations

3.2.1 Overview

Pursuant to California Government Code Section 53091, EBMUD, as a local agency and utility district serving a broad regional area is not subject to building and land use zoning ordinances (such as noise ordinances) for projects involving facilities for the production, generation, storage, or transmission of water. However, it is the practice of EBMUD to work with local jurisdictions and neighboring communities during project planning, and to consider local environmental protection policies for guidance.

At the local level, noise is addressed through the implementation of General Plan policies, including noise and land use compatibility guidelines, and through enforcement of noise ordinances. General Plan policies provide guidelines for determining whether a noise environment is appropriate for a proposed or planned land use. Local noise ordinances regulate such sources as mechanical equipment and amplified sounds, as well as prescribe hours of heavy equipment operation.

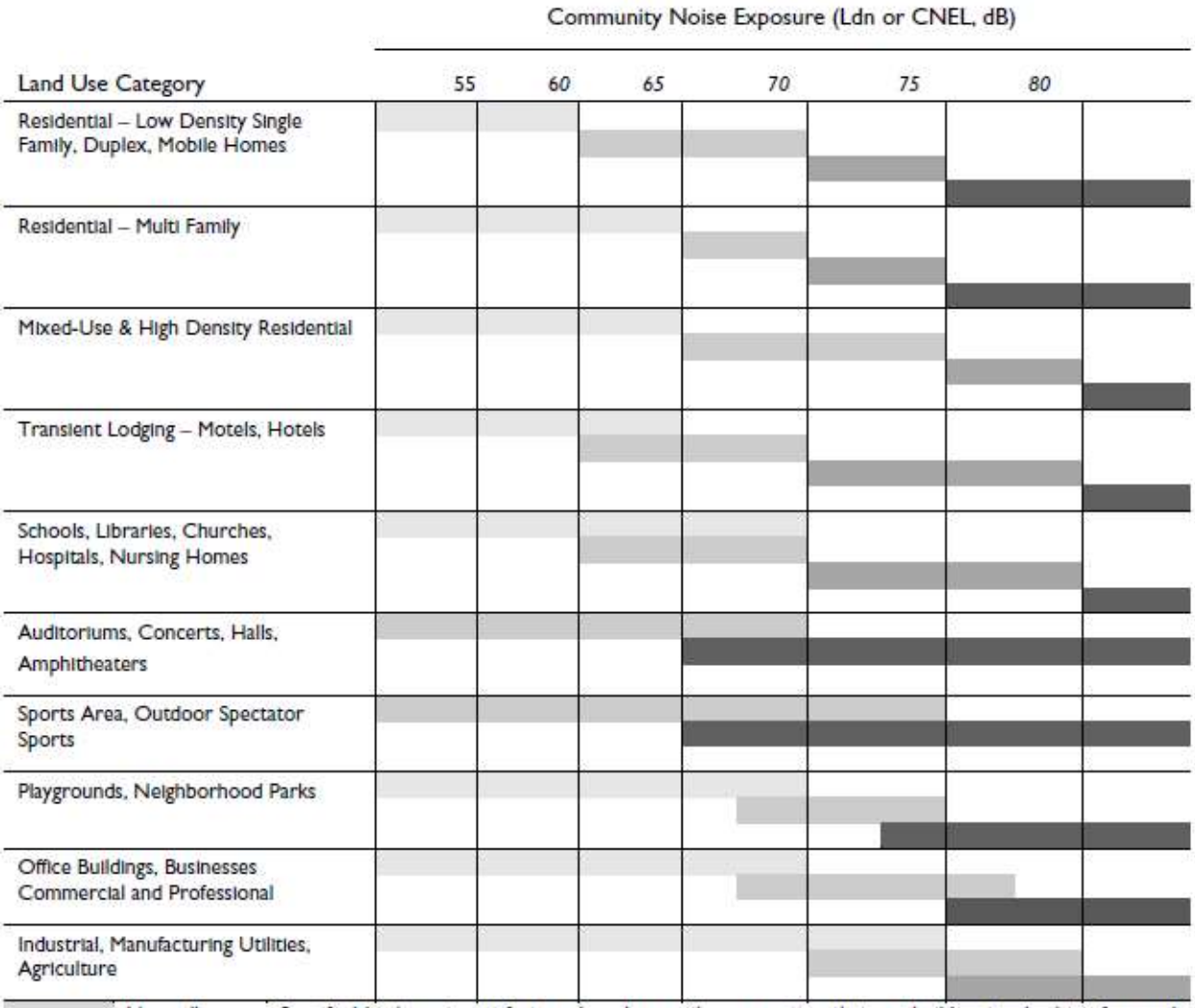
3.2.2 City of San Pablo

San Pablo General Plan

The General Plan, adopted by the City of San Pablo in 2011, specifies that noise from construction activities is regulated in the San Pablo Municipal Code (Municipal Code), which specifically prohibits all noise operations between 10 p.m. and 7 a.m., unless under emergency conditions. General Plan policies also require contractors to use best available control technology (e.g., noise attenuation fences, mufflers, and engine shrouds) to reduce the amount of noise generated.

The General Plan also identifies noise levels compatible with community land uses. Operational noise from the pumping plant and auxiliary infrastructure (e.g., generators, transformer) would be compared to the multi-family residential and school land use compatibility noise levels presented in Table 4 to determine permanent noise impacts.

Table 4 Land Use Compatibility for Community Noise Environments



Source: (City of San Pablo, 2011)

San Pablo Municipal Code

The Municipal Code Chapter 9.12 Noise Control, sections B and D, regulate noise from heavy equipment within the city (City of San Pablo, 2020). The specific noise prohibitions identified in the Municipal Code are presented below.

> **9.12.010 Specific Prohibitions**
>
> No person shall do, cause or suffer or permit to be done on any premises owned, occupied or controlled by such person, any of the following acts:
>
> A. Repair any auto body or fender unless within a completely enclosed building and the noises from such repairs are reasonably confined to such building;
>
> B. Operate or use in connection with building operations between the hours of ten p.m. and seven a.m. any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, power-driven saw or any other tool or apparatus the use of which is attended by loud or unusual noise, except by written permission of the building inspector, and then only in case of emergency;
>
> C. Keep or maintain any animal, crowing rooster or fowl which by any sound or cry annoys or disturbs persons owning, using or occupying property in the neighborhood;
>
> D. Test run trucks or other similar, heavy equipment, except for a reasonable warm-up period, between the hours of ten p.m. and seven a.m., unless such testing or running in is done within a building or specially designated structure, and the noise from such testing or running in is reasonably confined to such building or structure.

Noise generated during construction of the project would be evaluated against the provisions identified in the Municipal Code to determine temporary noise impacts.

San Pablo Zoning Ordinance

Chapter 17.50 of the San Pablo Zoning Ordinance (Municipal Code Title 17; adopted 2015) establishes noise regulations intended to implement the standards and policies set forth in the San Pablo General Plan (City of San Pablo, 2020). Section 17.50.050, Table 50-A of the San Pablo Zoning Ordinance (Zoning Ordinance) specifies Residential Noise Limits, which identifies the maximum allowable noise limits in residential zones. These are the noise limits when measured at the adjacent residential property line (exterior) or within a neighboring home (interior). Table 5 presents the noise limits for residential land uses, as set forth in the Zoning Ordinance.

As indicated in Table 5, the maximum allowable daytime (7 a.m. to 10 p.m.) exterior noise level in residential areas is 65 dBA, which is consistent with the maximum "normally acceptable" noise level identified for multi-family and high-density/mixed-use residential land uses, as presented in Table 4. The nearest sensitive receptor to the project site, Kona Apartments, is a

multi-family apartment complex and located in an area zoned as Commercial Mixed-Use District (City of San Pablo, 2018). Noise generated during operation of the project would be compared to the noise limits identified in the Zoning Ordinance to assess permanent noise impacts.

Table 5 San Pablo Zoning Ordinance Residential Noise Limits

Location of Measurement	Maximum Noise Level	
	10 p.m. to 7 a.m.	7 a.m. to 10 p.m.
Exterior	60 dBA	65 dBA
Interior	45 dBA	50 dBA

Notes:

1. It shall be unlawful for any person at any location within the city to create any noise or to allow the creation of any noise which causes the noise level when measured within any other fully enclosed (windows and doors shut) residential dwelling unit to exceed the interior noise standard in the manner described herein.
2. If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be determined, each of the noise limits above shall be reduced 5 dBA for noise consisting of impulse or simple tone noise.
3. Noise. Any proposed new housing exposed to Day-Night Sound Level (DNL) noise levels above 65 dB are subject to the General Plan standards for noise reduction (Chapter 9, Policy SN-I-40), which include acoustical design requirements that achieve the prescribed noise level reduction. Applicants must provide the necessary noise level reduction prepared by a board-certified acoustical engineer for each unit.

3.3 Construction Vibration Guidance

San Pablo does not establish a vibration limit for construction. The California Department of Transportation recommends the following vibration limits to avoid cosmetic damage to structures:

- 0.25 in/sec PPV for historic structures
- 0.5 in/sec PPV for new residential and modern commercial/industrial structures

3.3.1 EBMUD Standard Construction Specifications

EBMUD Standard Construction Specifications set forth the contract requirements for environmental compliance to which construction workers must adhere and stipulate that the construction contractor is responsible for maintaining compliance with applicable federal, state, and local requirements. These specifications are implemented on all EBMUD projects as part of standard construction procedures. Specifically, Standard Construction Specification 01 35 44,

Environmental Requirements, requires implementation of measures to reduce noise and vibration (EBMUD, 2020a).

EBMUD's Standard Construction Specification 01 35 44, Environmental Requirements, requires the implementation of various noise- and vibration-controlling measures, including the following:

- Submitting a Noise Control and Monitoring Plan, which details the means and methods for controlling and monitoring noise generated by construction activities, including demolition, alteration repair or remodeling of or to existing structures and construction of new structures, as well as by items of machinery, equipment or devices used during construction activities on the site. The plan must also detail the equipment and methods used to monitor compliance with the plan. (Section 1.3, Part G.1.)
- Complying with noise-level rules, regulations, and ordinances to the extent feasible. (Section 3.6, Part A.)
- Implementing noise-reduction measures such as muffling equipment, selecting quieter equipment, using noise barriers or noise control blankets around the construction site or major noise sources, etc. (Section 3.6, Parts B., H.3., and H.4.)
- If using impact equipment (e.g., jack hammers, pavement breakers, and rock drills), using hydraulically or electric-powered equipment wherever feasible to avoid noise associated with compressed-air exhaust from pneumatically powered tools. Where use of pneumatically powered tools is unavoidable, using an exhaust muffler on the compressed-air exhaust (which could achieve a reduction of approximately 10 dB); using external jackets on the tools, where feasible (which could achieve a reduction of approximately 5 dB); and implementing quieter procedures, such as drilling rather than impact equipment, whenever feasible. (Section 3.6, Part H.1.)
- Limiting of the noisiest phases of construction to 10 workdays at a time, where feasible. (Section 3.6, Part H.6.)
- Notifying neighbors/occupants within 300 feet of project construction regarding the estimated duration of the activity at least 30 days in advance of the extreme noise-generating activities. (Section 3.6, Part H.7.)
- Limiting truck operations (haul trucks and concrete delivery trucks) to daytime hours. (Section 3.6, Part E.)
- Preparing and implementing a Vibration Control and Monitoring Plan that details the means and methods for controlling and monitoring surface vibration generated by demolition and other work. (Section 1.3, Part H.1.)
- Limiting surface vibration to no more than 0.5 in/sec PPV measured at the nearest residence or other sensitive structure. (Section 3.5, Part A.)

EBMUD's Standard Construction Specification 01 14 00, Work Restrictions, restricts construction hours as described below (EBMUD, 2020b).

- Noise-generating activities greater than 90-dBA (impact construction such as concrete breaking, concrete crushing, tree grinding, etc.) shall be limited to the hours of 8:00 a.m. to 4:00 p.m., Monday through Friday (Section 1.8, Part A).

4 Project Impacts and Mitigation Measures

4.1 Significance Criteria

4.1.1 Criteria

Consistent with Appendix G of the CEQA Guidelines, the project is considered to have a significant impact related to noise if it would:

1. Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies;
2. Generate excessive groundborne vibration or groundborne noise levels; or
3. Expose people residing or working in the project area to excessive noise levels, if the project is located within the vicinity of a private airstrip or an airport land use plan, or, where such a plan has not been adopted, within two miles of a public airport or public use airport.

4.1.2 Thresholds of Significance

The following criteria are based on noise impact statements included in the CEQA Guidelines Appendix G checklist and were used to evaluate the significance of environmental noise resulting from the project:

1. **Temporary or Permanent Noise Increases in Excess of Established Standards**: A significant impact would be identified in the following cases.
    a. Temporary Construction Noise in Excess of Standards. Construction noise impacts would be considered significant if project construction conflicts with the requirements specified in the Municipal Code.
    b. Permanent Operational Noise in Excess of Standards. A significant impact would be identified if noise generated by Wildcat PP operational equipment were to exceed the land use compatibility noise levels presented for each land use type in Table 4 and the noise limits in the San Pablo Zoning Ordinance (as presented in Table 5).
2. **Generation of Excessive Groundborne Vibration:** A significant impact would be identified if the groundborne vibration levels from construction exceed 0.25 in/sec PPV at sensitive or historic structures and/or 0.5 in/sec PPV at new residential or modern commercial/industrial structures.
3. **Excessive Aircraft Noise Exposure:** A significant impact would occur if the project resulted in frequent exposure of people to aircraft noise that exceeds 70 dB CNEL.

4.2 Impacts and Mitigation Measures

Impact Noise-1: Potential to generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies. ***(Less than Significant Impact)***

Construction

Overview

Construction noise would be generated during construction activities associated with the project. Variables that influence the level of noise generated include the type of construction equipment used, the timing and duration of noise-generating activities, the distance between construction noise sources and noise-sensitive receptors, any shielding provided by intervening structures or terrain, ambient noise levels, and use of noise source controls. These variables as they relate specifically to the project are described in further detail below.

- **Construction Equipment Type.** Each construction phase would include a different mix of active, noise-generating equipment. The highest noise levels are typically generated during site grading and excavation activities, as these phases often require the simultaneous use of multiple pieces of heavy equipment, such as dozers, excavators, scrapers, and loaders. Lower noise levels result from construction activities when less heavy equipment is required to complete the tasks. Table 6 provides the average (L_{eq}) and maximum (L_{max}) noise levels for construction equipment planned for use during project construction activities. Individual equipment proposed for construction of the project are anticipated to generate noise levels ranging from 66 to 87 dBA L_{eq} and 67 to 92 dBA L_{max} at a distance of 50 feet from the source.
- **Timing and Duration of Noise-Generating Activities.** The total construction duration of all components of the project is anticipated to last approximately 69 weeks; however, construction duration and noise exposure at any single location would vary depending on the project component. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (i.e., early morning, evening, or nighttime hours), when construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction durations last over extended periods of time. Construction would typically be conducted during weekdays between 7 a.m. and 7 p.m. (as permissible under the Municipal Code[4]), with construction typically occurring over an 8-hour work period during this timeframe. Furthermore, construction of the project components would occur sequentially (as opposed to concurrently) by construction phase, thereby limiting the location and duration of exposure to elevated noise levels during the total project construction period. In general,

[4] San Pablo Municipal Code allows weekday construction between 7 a.m. and 10 p.m.

project construction work would occur in two major phases: pumping plant construction and Road 20 storm drain pipeline construction, each including several sub-phases.

- **Distance and Shielding Between Noise-Sensitive Receptors and Noise Sources.** Construction-generated noise levels decrease at a rate of approximately 6 dBA per doubling of the distance between the construction equipment noise source and receptor. Shielding by buildings or terrain can provide an additional 5 to 20 dBA of noise reduction at distant receptors. Given the density of development in the project area, most surrounding properties other than those directly adjoining the sites would be provided approximately 20 dBA of shielding from intervening structures. Receptors within 1,000 feet of the project site, but visually blocked by intervening structures were assumed to receive a 20-dBA reduction in construction noise, in addition to the reduction afforded by distance attenuation. For the purposes of the analysis below, an 8-dBA reduction[5] was assumed for existing 6-foot-tall concrete walls occurring along the perimeter of adjacent receptors.
- **Ambient Noise Levels.** Ambient noise, or the existing, pre-project noise level, is considered in the noise analysis. In some locations, such as at the El Portal Drive and Road 20 intersection, ambient noise levels from vehicle traffic are relatively high, which may exceed noise generated by quieter project construction phases (e.g., equipment testing and suction and discharge pipeline construction).
- **Noise Source Controls**. Noise source controls (e.g., mufflers) on construction equipment have been found to reduce noise levels by 5 dBA (FHWA, 2006). EBMUD Standard Construction Specifications 01 35 44, Environmental Requirements, require the use of noise source controls on construction equipment, when available, on all construction projects (EBMUD, 2020a).

The Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) (FHWA, 2008) was used to estimate the noise levels at the closest noise-sensitive receptors during each project sub-phase. Construction noise was modeled using the two dominant noise-emitting construction equipment operating during each project sub-phase.[6] A list of typical construction equipment and associated noise levels at a reference distance of 50 feet is provided in Table 6. Distances to sensitive receptors were calculated from the center of the pumping plant site and a moving midpoint of the storm drain pipeline trench location.

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[5] An 8-dBA reduction for a 6-foot-tall concrete wall is based on guidance included in the FHWA's *Best Practices for Calculating Estimated Shielding for Use in the RCNM* (FHWA, 2017).

[6] Combined noise levels produced by multiple noise sources are calculated using logarithmic summation. For example, if one noise source produces a noise level of 50 dBA, then two of the identical sources side by side would generate a combined noise level of 53 dBA, or an increase of only 3 dBA.
Equation: $10\ \mathrm{Log}_{10}\ (10^{5.0}+10^{5.0}) = 53$ dBA

Table 6 Construction Equipment 50-foot Noise Emission Levels (dBA)

Equipment Category	Leq[1,2,3]	Lmax[1,2]	Equipment Category	Leq[1,2,3]	Lmax[1,2]
Backhoe	74	78	Excavator	77	81
Boom Truck	74	81	Flatbed Truck (On-Site)	70	74
Chainsaw	77	84	Fork Lift	68	75
Compactor (Plate)	76	83	Dump Truck (On-Site)	73	77
Compactor (Roller)	73	80	Generator	78	81
Compressor	74	78	High Density Poly Ethylene Fusion Machine	50	58
Concrete Mixer Truck	75	79	Paving - Asphalt (Paver, Dump Truck)	74	77
Concrete Pump Truck	74	81	Pump	78	81
Concrete Saw [4]	83	90	Street Sweeper	72	82
Crane	73	81	Welding Machine	70	74
Drill Rig	76	79			

1 Measured at 50 feet from the construction equipment.

2 Lmax noise levels apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation. L_{eq} noise levels also consider the duration of an overall time period that the equipment is operating at full power, also known as the "usage factor".

3 Noise levels assume that all construction equipment is equipped with noise control devices (e.g., mufflers) by the manufacturer; therefore, the noise levels presented in this table include attenuation from these noise control devices.

4 Noise control devices are not currently available for concrete saws.

Source: (FHWA, 2006; McElroy Manufacturing, Inc., 2018)

Pumping Plant

The RCNM noise model was used to estimate the worst-case project construction noise levels for each pumping plant construction sub-phase, as shown in Table 7Error! Reference source not found..

The unshielded modeled construction noise levels for nearly all pumping plant construction sub-phases exceeded ambient noise levels at the nearest residences and Walter T. Helms Middle School. Noise levels would be reduced or influenced due to various existing design features associated with nearby receptors. These design features include the presence of an approximately 6-foot-tall concrete perimeter walls along the perimeter of receptor property lines that face the project site at the Rancho San Pablo residential complex, Abella residential complex, and Walter T. Helms Middle School. The presence of this wall would reduce construction noise to these receptors by up to 8 dBA. Additionally, the absence of windows for sensitive interior residential spaces (e.g., bedrooms and main living areas) facing the project site, including at Kona Apartments, would reduce interior noise levels and impacts to residents

during construction. Furthermore, the administrative and classroom buildings at the Walter T. Helms Middle School and residential properties across El Portal Drive and Road 20 have relatively distant setbacks from the project site, which would attenuate construction noise generated at the project site. Busy roadways immediately adjacent to the project site, including Road 20, El Portal Drive, and Church Lane, also have relatively high ambient noise from existing traffic, which help to offset an increase in the noise environment from construction. These factors are discussed as they relate to the nearest sensitive receptors below.

The sensitive receptor that would experience the highest levels of construction noise would be the Kona Apartments, located immediately adjacent to the southern boundary of the project site. Construction noise levels at the apartment complex are anticipated to range from approximately 62.6 to 78.1 dBA (L_{eq}) during construction of the pumping plant. The loudest noise would occur during the civil site work phase, when noise levels are anticipated to reach approximately 78.1 dBA (L_{eq}) and 84.6 dBA (L_{Max}).

Daytime ambient noise measurements collected at various locations around the Kona Apartments range from approximately 55.4 dBA to 68.8 dBA (Table 2). Construction of the pumping plant would occur during daytime construction hours and would result in a temporary noise increase of up to 9.3 dBA (L_{eq}) during the 69-week construction period. Construction would not occur at night or on weekends or holidays, when nearby residents are anticipated to be most sensitive to noise. As such, the impact of construction noise on residential receptors would be less than significant.

Walter T. Helms Middle School would experience elevated noise levels during construction; however, noise levels at the middle school would not reach levels at the Kona Apartments due to an existing concrete wall that occurs along the eastern perimeter of the school. Additionally, administrative and instructional buildings are located approximately 150 feet from the pumping plant site and are blocked by a multipurpose building located 50 feet west of the project site. The distance and intervening structures provide greater noise attenuation for the administrative and instructional buildings. Construction noise at the school is anticipated to range from approximately 50.6 to 60.1 dBA (L_{eq}), with the loudest noise from pumping plant construction occurring during the civil site work phase when noise levels would reach approximately 60.1 dBA (L_{eq}) and 66.6 dBA (L_{Max}) at the school. Ambient noise levels at the school are anticipated to be greatly influenced by traffic along Road 20. Ambient noise along Road 20 and El Portal Drive at the Wildcat PP site was measured to be 67.1 dBA (L_{eq}) at a distance of 15 feet from the curb of the road (Table 2). Construction noise levels would be similar to existing traffic noise and would not substantially raise noise levels at the school administrative or instructional buildings. Furthermore, construction of the proposed project would occur during the allowable construction noise hours established by the General Plan and Municipal Code. The impact from construction noise on the school would be less than significant.

Table 7 Modeled Noise Impacts Associated with Pumping Plant Construction

Construction Phase	Approx. Duration	Dominant Noise-Generating Equipment	Closest Sensitive Receptor	Average Distance (feet) [b]	Construction Noise Level (dBA) (Unshielded)		Construction Noise Level (dBA) (Shielded) [a]	
					L_{eq}	L_{max}	L_{eq}	L_{max}
Mobilization	1 week	Backhoe	Residential (Kona Apt)	100	67.6	71.5	67.6	71.5
			School (Helms)	100	67.6	71.5	59.6	63.5
Site Preparation (during tree removal)	1-2 days	Backhoe, Chain Saw	Residential (Kona Apt)	100	72.4	77.7	72.4	77.7
			School (Helms)	100	72.4	77.7	64.4	69.7
Site Preparation (at all other times)	1 week	Backhoe	Residential (Kona Apt)	100	67.6	71.5	67.6	71.5
			School (Helms)	100	67.6	71.5	59.6	63.5
Initial Excavation and Grading	2 weeks	Backhoe, Excavator	Residential (Kona Apt)	100	72.4	74.7	72.4	74.7
			School (Helms)	100	72.4	74.7	64.4	66.7
Construction (during concrete work)	26 weeks	Concrete Mixer Truck, Concrete Pump Truck	Residential (Kona Apt)	50	77.6	81.4	77.6	81.4
			School (Helms)	100	71.6	75.4	63.6	67.4
Construction (during pump installation)	19 weeks	Crane, Material Truck	Residential (Kona Apt)	50	74.6	80.6	74.6	80.6
			School (Helms)	100	68.6	74.5	60.6	66.5
Construction (suction and discharge pipelines)	2 weeks	Excavator, Generator	Residential (Rancho San Pablo)	150	70.7	71.2	62.7	63.2
			School (Helms)	100	74.2	74.7	66.2	66.7
Equipment Testing	10 weeks	N/A	--	--	--	--	--	--
On-Site Drainage	1 week	Backhoe, Material Truck	Residential (Kona Apt)	100	70.1	71.5	70.1	71.5
			School (Helms)	100	70.1	71.5	70.1	71.5

Construction Phase	Approx. Duration	Dominant Noise-Generating Equipment	Closest Sensitive Receptor	Average Distance (feet) [b]	Construction Noise Level (dBA) (Unshielded)		Construction Noise Level (dBA) (Shielded) [a]	
					L_{eq}	L_{max}	L_{eq}	L_{max}
Civil Site Work: CMU wall, Fence, Driveway, and Landscaping (during pavement sawing)	1-2 days	Backhoe, Concrete Saw	Residential (Kona Apt)	50	83.1	89.6	83.1	89.6
			School (Helms)	100	77.1	83.6	69.1	75.6
Civil Site Work: CMU wall, Fence, Driveway, and Landscaping (at all other times)	2 weeks	Backhoe, Concrete Mixer Truck	Residential (Kona Apt)	50	77.3	78.8	77.3	77.8
			School (Helms)	100	71.2	72.8	63.2	64.8

[a] Existing 6-foot concrete walls along the east side of Walter T. Helms Middle School, El Portal Drive (Rancho San Pablo Residential Complex), Road 20 (Abella Residential Complex) provide approximately 8 dBA reduction.

[b] Represents the distance from the center of the project site to the nearest point of the closest sensitive receptor.

Road 20 Storm Drain Pipeline

The RCNM noise model was used to estimate the worst-case project construction noise levels for each storm drain pipeline construction sub-phase, as shown in Table 8. Although storm drain pipeline construction would occur closest to the Abella residential complex north of Road 20, the southern perimeter of the complex is lined with a 6-foot-tall concrete wall, separating it from the storm drain pipeline alignment. The presence of the existing wall would attenuate noise levels experienced by residents within this complex by approximately 8 dBA. Construction noise would be the loudest at Walter T. Helms Middle School, which would have a direct line-of-sight to the storm drain pipeline construction alignment. Daytime ambient noise levels were measured as 67.1 dBA (L_{eq}) at ST-1, which is located near the Road 20/El Portal Drive intersection. The General Plan identifies ambient noise from traffic on Road 20 as approximately 60 dBA (L_{dn}), or 62 dBA (L_{eq}[peak hour]). Construction noise levels are anticipated to range from approximately 60.6 to 77.1 dBA (L_{eq}) during construction of storm drain pipeline with the loudest noise generated during use of a concrete saw, which is anticipated to require a total of two days for the entire 725-foot alignment of the storm drain pipeline. Concrete saw cutting would generate noise levels of approximately 77.1 dBA (L_{eq}) and 83.6 dBA (L_{Max}) at the external walls of school buildings. As such, construction of the storm drain pipeline would increase noise levels in the project vicinity by more than 10 dBA during concrete saw cutting. Noise from the remaining construction phases would increase noise in the vicinity of Road 20 by an average of 5.3 dBA for approximately three weeks. Construction of the storm drain pipeline would not generate noise along the entire alignment for the full three-week construction duration. Rather, construction would move along the alignment, completing approximately 80 to 200 feet of pipeline construction per day. Construction of the storm drain pipeline would increase noise levels at the school; however, these construction activities are scheduled to occur during the summer when school is not in session and the majority of school staff and students are not on campus. As such, summer construction is not anticipated to affect students or classroom learning; however, school staff may be present on campus for other administrative duties during summer construction activities. Construction activities would occur on weekdays during daytime hours, in accordance with the General Plan and Municipal Code. Therefore, the construction noise impact on the school would be less than significant.

Table 8 Modeled Noise Impacts Associated with Storm Drain Pipeline Construction

Construction Phase	Approx. Duration [a]	Dominant Noise-Generating Equipment	Closest Sensitive Receptor	Average Distance (feet) [b]	Construction Noise Level (dBA) (Unshielded) [c]		Construction Noise Level (dBA) (Shielded) [c d]	
					L_{eq}	L_{max}	L_{eq}	L_{max}
Road 20 Storm Drain Pipeline Installation (during pavement sawing)	1-2 days	Backhoe, Concrete Saw	Residential (Abella)	60	81.5	83.4	73.5	75.4
			School (Helms)	100	77.1	83.6	77.1	83.6
Road 20 Storm Drain Pipeline Installation (during drain installation)	2 weeks	Backhoe, Excavator, Material Truck	Residential (Abella)	60	77.8	79.1	69.8	71.1
			School (Helms)	100	73.4	74.7	73.4	74.7
Road 20 Storm Drain Pipeline Installation (during final grading, backfill, and paving)	2 weeks	Asphalt Paver, Compactor (Roller), Material Truck	Residential (Abella)	60	76.4	78.4	68.4	70.4
			School (Helms)	100	72.0	74.0	72.0	74.0
Demobilization	1 week	Street Sweeper	Residential (Abella)	60	68.1	81.0	60.1	73.0
			School (Helms)	100	65.6	75.6	65.6	75.6

[a] Storm drain pipeline construction moves along the alignment, with approximately 80 to 200 feet of pipeline constructed in a day, including the excavation, installation, grading, backfilling, and paving occurring daily for each segment. The total duration of storm drain pipeline construction is anticipated to be approximately 3 weeks.

[b] Represents the distance from a moving center of the storm drain pipeline alignment to the closest sensitive receptor. Residences are, on average, approximately 60 feet from the storm drain pipeline alignment. Helms Middle School administration and instruction buildings are approximately 100 feet from the storm drain pipeline alignment.

[c] Noise levels are calculated to describe worst-case noise scenarios when construction equipment is operating along a center point along the pipeline alignment directly in front of the receptor.

[d] Existing 6-foot-tall concrete walls along El Portal Drive (Rancho San Pablo Residential Complex) and Road 20 (Abella Residential Complex) provide a reduction of approximately 8 dBA.

Operation

Overview

The storm drain pipeline along Road 20 would not generate any operational noise; therefore, the discussion below is limited to impacts from operational noise from the pumping plant.

Pumping Plant

The Wildcat PP would consist of four approximately 8-mgd pumps, associated mechanical and electrical equipment located inside an approximately 40-foot-wide, 80-foot-long, and 24-foot-tall building.

The specific pump manufacturer and models have not been identified; therefore, the analysis below is based on noise data collected from pumps with similar power and speed ratings. Each pump is expected to produce a sound level of approximately 86 dBA at 3 feet in a non-reverberant, open air, environment (Hoover & Keith, 1996). The pumps at the new Wildcat PP would be located inside a new building. Based on the consideration of a typical reverberant noise buildup within the pumping plant building interior, the calculated sound level for one pump operating within the pumping plant is approximately 90 dBA at 3 feet and approximately 88 dBA at the inside face of the building perimeter. Although the pumping plant would be equipped with four pumps, only three pumps would be in simultaneous operation at any given time, with the fourth pump only used as backup. The simultaneous operation of three pumps would result in a total noise level of approximately 92.8 dBA at the inside face of the pumping plant building perimeter. Considering these interior levels, the noise level for three pumps operating inside of the enclosed pumping plant would be approximately 57.8 dBA at a distance of 50 feet from the building on the side with an open (non-acoustically rated) louver, and approximately 27.8 dBA L_{eq} at a distance of 50 feet on the side of the building without any openings.

The pumping plant building design includes acoustical louvers on the eastern and western walls of the pumping plant. No louvers or doors would be constructed on the southern wall of the pumping plant building, which faces the Kona Apartment complex. Noise from the pumps inside the enclosed pumping plant would be approximately 26.2 dBA (L_{dn}) at the Kona Apartments, when considering the 8-dBA reduction from the 8-foot-tall CMU wall constructed at the southern boundary of the project site.

The General Plan identifies noise sources of up to 65 dBA (L_{dn}) as "Normally Acceptable" in multifamily residential areas and up to 70 dBA (L_{dn}) for schools. The Zoning Ordinance has an established noise limit of 65 dBA for daytime noise and 60 dBA for nighttime noise in residential zones. The Zoning Ordinance does not establish noise limits for schools. The General Plan also identifies ambient noise levels in the vicinity of El Portal Drive to be approximately 65 to 70 dBA L_{dn}, which was verified to be accurate based on noise measurement data in the vicinity. Therefore, existing ambient noise levels at this residential land use has reached (if not exceeded) the maximum daytime residential noise limit of 65 dBA, as established by the Zoning Ordinance. The minimal noise generated by operation of the pumping plant would be offset by the existing ambient noise levels and would not increase noise levels above noise limits set forth

by the General Plan or the Zoning Ordinance. The noise impact from operation of the pumping plant would be less than significant.

Impact Noise-2: Potential to generate excessive groundborne vibration or groundborne noise levels. ***(Less than Significant Impact)***

Construction

Construction of the Wildcat PP and associated storm drain infrastructure include grading and excavation in proximity to existing structures and may generate perceptible vibration and levels that could affect nearby structures when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used in the vicinity of nearby sensitive land uses. Building damage generally falls into three categories:

- **Cosmetic damage** (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects.
- **Minor damage** is defined as hairline cracking in masonry or the loosening of plaster.
- **Major structural damage** is defined as wide cracking or the shifting of foundation or bearing walls.

The Kona Apartments are located approximately 18 feet from the new Wildcat PP building. Construction of the bioretention planters and CMU wall would occur approximately 5 feet from the apartment building. Table 9 presents construction vibration levels at a reference distance of 25 feet and at various distances from a variety of vibration-inducing heavy construction equipment. Equipment identified in Table 6 that are not included in Table 9 are not anticipated to generate vibration at the level that would cause damage to structures, even in close proximity. Vibration levels for vibration-inducing equipment identified in Table 9 would vary depending on soil conditions, construction methods, and equipment used. Vibration levels are highest closest to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet.

Construction vibration would be anticipated to exceed the threshold for cosmetic damage to normal conventional construction (0.5 in/sec PPV) or a historic structure (0.25 in/sec PPV) if project construction would require the use of a clam shovel or vibratory roller within 12 feet or 21 feet, respectively, of the nearby structure. All other project construction equipment would be anticipated to generate vibration levels below the cosmetic damage thresholds. Construction of the new Wildcat PP and storm drain pipeline construction would not require the use of a clam shovel drop. Furthermore, no historic structures are located within 21 feet of the project site; therefore, no impacts resulting from groundborne vibration would occur to historic structures. Vibratory rollers may be used for compacting soils during construction of the new pumping plant and storm drain pipeline. The Kona Apartment complex could be damaged if use of a vibratory roller occurred within 12 feet of the building. However, a vibratory roller would not be used during construction of the CMU wall or bioretention plantings, or other activities within 12 feet of the apartment complex. Vibration levels would be lower as construction moves

away from nearby structures or when lower-vibration construction equipment and methods are used. Therefore, the project is not anticipated to generate vibration levels that would result in damage to nearby structures. The construction impact from groundborne vibration would be less than significant.

Table 9 Vibration Levels for Construction Equipment at Various Distances

Equipment	PPV (in/sec) at Given Distance				
	12 feet	20 feet	25 feet	50 feet	70 feet
Vibratory Roller	0.471	0.268	0.210	0.098	0.068
Hoe Ram	0.200	0.114	0.089	0.042	0.029
Large bulldozer	0.200	0.114	0.089	0.042	0.029
Caisson drilling	0.200	0.114	0.089	0.042	0.029
Loaded trucks	0.170	0.097	0.076	0.035	0.024
Jackhammer	0.078	0.045	0.035	0.016	0.011
Small bulldozer	0.007	0.004	0.003	0.001	0.001

Source: (Federal Transit Administration, 2018) modified by Illingworth & Rodkin, Inc., August 2020.

Operation

Operational equipment is not anticipated to generate perceptible levels of vibration off-site resulting in a less than significant impact.

Impact Noise-3: For a project located within the vicinity of a private airstrip or an airport land use plan, or, where such a plan has not been adopted, within two miles of a public airport or public use airport, potential to expose people residing or working in the project area to excessive noise. ***(No Impact)***

Construction

Aircraft noise is not an issue of concern during project construction. The project site and vicinity are far outside the any CNEL contour for a major Bay Area airport that defines a significant impact under federal, State of California or General Plan criteria.

Operation

Aircraft noise is not an issue of concern during project operation. The project site and vicinity are far outside the any Ldn/CNEL contour for a major Bay Area airport that defines a significant impact under federal, State of California or General Plan criteria.

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