

Devcon Construction
Google Caribbean Campus
Construction Noise Evaluation

Rev 1 | March 29, 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 258499

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ARUP

1 Introduction

This report addresses construction noise sources of the Google Caribbean Campus construction project, and their potential impacts on the surrounding community. The report defines and characterizes noise sources, identifies nearby receivers that could be affected by the noise, and where needed, proposes measures for reducing the noise from these sources.

The project consists of demolition of all existing buildings on the site and construction of two new buildings totaling more than 1,000,000 square feet of office and support space.

2 Code Criteria

City of Sunnyvale Municipal Code Section 16.08.030 covers allowable hours of construction and construction noise limits. The code specifies that:

Construction activity shall be permitted between the hours of seven a.m. and six p.m. daily Monday through Friday. Saturday hours of operation shall be between eight a.m. and five p.m. There shall be no construction activity on Sunday or federal holidays when city offices are closed.

No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent residential neighborhoods.

Further, the code states that:

(b) *As determined by the chief building official:*

(1) *No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent properties.*

...

(3) *Where additional construction activity will not be a nuisance to surrounding properties, based on location and type of construction, a waiver may be granted to allow hours of construction other than as stated in this section.*

Based on Code Section 16.08.030, we have analyzed the potential construction noise sources for impacts on nearby residential properties.

3 Sensitive receivers

Figure 1 below provides a zoning map of the nearby areas, from the City of Sunnyvale website. The nearest residential properties are approximately 3,000 ft from the site.

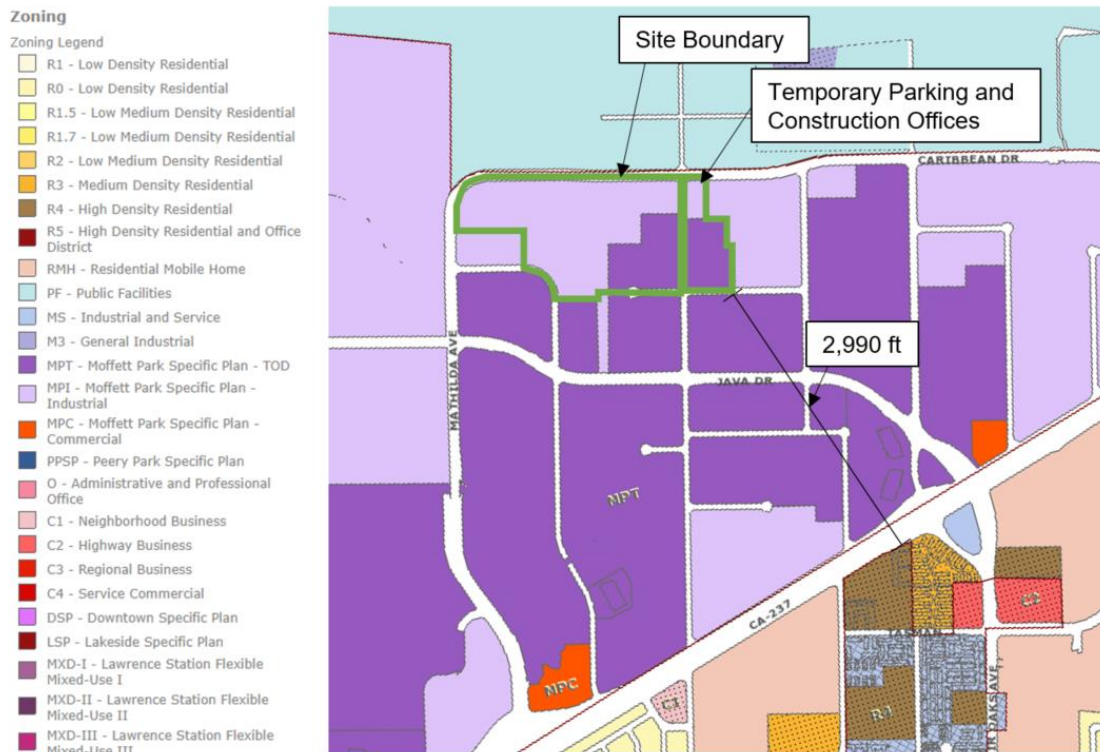


Figure 1: Map showing distance to nearest residential receivers

4 Existing noise environment

Ambient background noise levels near the site were measured as part of our site noise study. We expect these levels to be similar to levels at the nearest residential areas.

Measurement Results:

- **50 dBA** average daytime background noise level at site (5-min Leq)

Note that this level is derived from the same data as the levels reported in the *Code evaluation: Site & CUP Noise report*, but uses a different metric to derive typical daytime background noise levels.

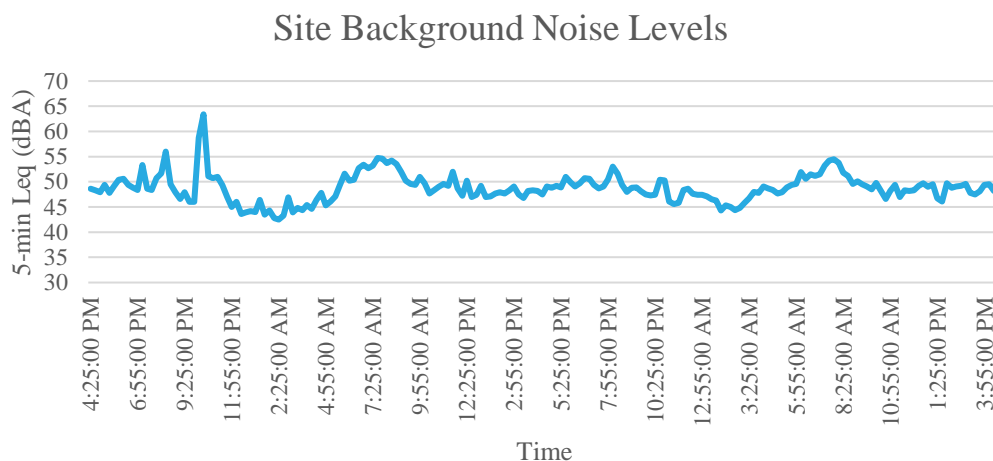


Figure 2: Chart of measured background noise levels

5 Noise Sources

The following table provides expected construction noise actives on site, and corresponding estimated noise levels. The expected equipment types have been provided by Devcon, and the expected noise levels are based on the Federal Highway Administration Construction Noise Handbook.

Equipment	Source Noise Level (dBA @ 50 ft)*	Source Noise Level (dBA @ 3,200 ft)*
All Other Equipment > 5 HP	85	49
Auger Drill Rig	84	48
Backhoe	78	42
Chain Saw	84	48
Compactor (ground)	83	47
Compressor (air)	78	42
Concrete Batch Plant	83	47
Concrete Mixer Truck	85	49
Concrete Pump Truck	82	46
Concrete Saw	90	54
Crane	81	45
Dozer	82	46
Drill Rig Truck	79	43
Dump Truck	76	40
Excavator	81	45
Flat Bed Truck	74	38
Front End Loader	79	43

Generator	81	45
Generator (<25KVA, VMS Signs)	73	37
Gradall	83	47
Grader	85	49
Grapple (on backhoe)	87	51
Hydra Break Ram	90	54
Jackhammer	89	53
Man Lift	75	39
Mounted Impact Hammer (hoe ram)	90	54
Pavement Scarifier	90	54
Asphalt Grinder	90	54
Concrete/Asphalt Crusher	90	54
Paver	77	41
Pickup Truck	75	39
Pneumatic Tools	85	49
Pumps	81	45
Rivit Buster/Chipping Gun	79	43
Roller	80	44
Scraper	84	48
Sheers (on backhoe)	96	60
Tamper	90	54
Tractor	84	48
Vacuum Excavator (Vac-Truck)	85	49
Vacuum Street Sweeper	82	46
Ventilation Fan	79	43
Welder/Torch	74	38
Loudest Equipment	96	60

* L_{max}

6 Analysis

Based on the measured background noise levels and estimated peak equipment noise levels, we do not expect any noise disturbance at the nearest residential receivers.

Occasional peak noise events may be just audible above the ambient background noise outdoors, but we do not expect any construction activities to be audible indoors.

7 Hours of operation

In accordance with the City of Sunnyvale code, the expected construction hours will be:

7AM to 6PM daily Monday through Friday.

8AM to 5PM Saturday.

No construction activity on Sunday or federal holidays when city offices are closed.

8 Mitigations

The following noise control measures should be implemented during construction in order to minimize noise disturbances at the nearby areas. These noise control measures are conceptual in nature; alternative measures may also be equally effective. The primary goal of any noise mitigation plan is to provide the most effective and practical techniques for controlling the construction site noise emission.

- Ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational.
- Use electric-powered instead of diesel-powered equipment and hydraulic tools instead of pneumatic impact tools whenever possible.
- Turn off idling equipment, whenever possible.
- Construction activities shall be limited to daytime hours, 7 a.m. to 6 p.m. on Monday through Friday and 8 a.m. to 6 p.m. on Saturday. No noise generating construction activities shall take place on Sundays and holidays.

9 Conclusions

- The noise created by the proposed CUP meets the guidelines outlined by the city of Sunnyvale's Municipal code. This calculation can be updated if equipment is reselected or added.
- Noise transmission from the CUP to outdoor program spaces will be below ambient noise.
- The noise at the sites is normally acceptable for commercial uses.
- No special-purpose acoustic measures are required of the building envelope for Caribbean and Borregas based on our measurements and CALGreen. Even

so the façade will reduce existing ambient exterior noise sufficiently to meet 50 dBA Leq1hr as per CALGreen 5.507.4.2.

- Construction noise will be addressed operationally as described.