LEHIGH CEMENT PLANT
NOISE MONITORING REPORT

CITY OF CUPERTINO
PUBLIC WORKS DEPARTMENT

November 29, 2016

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Lehigh Cement Plant
Noise Monitoring Report

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1.0 Executive Summary

- Unattended, continuous noise measurements were conducted at two locations to quantify and characterize noise from Lehigh Cement Plant operations due to neighborhood complaints. The measurements started around 2:00 PM on October 3, 2016, and concluded around 10:00 AM on October 28, 2016.

- The noise environment during the nighttime hours (10 PM to 7 AM) at the two measurement locations was characterized by crickets, wildlife, periodic aircraft flyovers, traffic on nearby roads, suburban noises (e.g., music from inside the houses, people talking), and occasional cement plant noise.

- Cement plant noise was clearly audible for discrete periods on two nights, October 3 and October 11. However, the cement plant noise level during these time periods did not exceed the County noise ordinance. Graphs showing the sound levels and links to the audio files are contained in this report.

2.0 Project Description

The Lehigh Cement Plant is located at Permanente Quarry, a limestone quarry in an unincorporated area of Santa Clara County (the County), California. The quarry is a limestone and aggregate mining operation, with a cement plant (the Plant) located just west of Cupertino owned by Lehigh Southwest Cement. The Plant recently undertook noise studies to verify noise reduction modifications of an induced draft fan in June 2015; however, the Plant has received continued complaints due to noises described by nearby residents as “continuous machinery, start-ups and stoppages of conveyer belts, kiln, rock crushers, and many other heavy machinery.”

CSDA Design Group was retained to conduct and analyze one month of noise measurements (with audio recordings) to determine if the Plant’s noise levels were above the Santa Clara County noise standards. This report provides a summary of our findings for the continuous noise measurements conducted during October of 2016.

3.0 Acoustical Criteria and Measurement Locations

The Santa Clara County Code of Ordinances[1] stipulates that single-family residential land shall not be subject to noise levels above 55 dBA during the day and 45 dBA during the night for noise sources with durations of at least 30 minutes in an hour. It further stipulates a penalty of five decibels for noise that “contains a steady, audible tone such as a whine, screech or hum or contains music or speech.” Based on the tonality and character of noise heard in the audio files (discussed later in the report), it is appropriate to use the 5 dBA penalty. Table 3-1 contains the applicable criteria for the survey.

[1]Santa Clara County Code 2016 § B11-152:
https://www.municode.com/library/ca/santa_clara_county/codes/code_of_ordinances?nodeId=TITBRE_DIVB11ENHE_CHVIIICONOVI_SB11-152EXNOLI

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Table 3-1: Santa Clara County Code of Ordinances Noise Standards for Noise with Steady, Audible Tones

Receiving Land Use Category	Time Period	Maximum Noise Level (dBA)
One- and Two-family Residential	10 PM to 7 AM	40
	7 AM to 10 PM	50

Specifically, Section B11-152(a)(2) has the language:

> *(2) No person may operate or cause to be operated any source of sound at any location within the unincorporated territory of the county or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by the person, which causes the noise level when measured on any other property either incorporated or unincorporated, to exceed:*
> *a. The noise standard for that land use as specified in table B11-152 for a cumulative period of more than thirty minutes in any hour; or*
> *b. The noise standard plus five dB for a cumulative period of more than fifteen minutes in any hour; or*
> *c. The noise standard plus ten dB for a cumulative period of more than five minutes in any hour; or*
> *d. The noise standard plus fifteen dB for a cumulative period of more than one minute in any hour; or*
> *e. The noise standard plus twenty dB or the maximum measured ambient, for any period of time.*
>
> *(3) If the measured ambient level exceeds that permissible within any of the first four noise limit categories above, the allowable noise exposure standard will be increased in five dB increments in each category as appropriate to encompass or reflect the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under the category will be increased to reflect the maximum ambient noise level.*

Figure 3-1 depicts the two designated sound monitoring sites and the location of the cement plant. Figure 3-2 shows a typical noise monitor installation.

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Figure 3-1: Noise Monitoring Locations

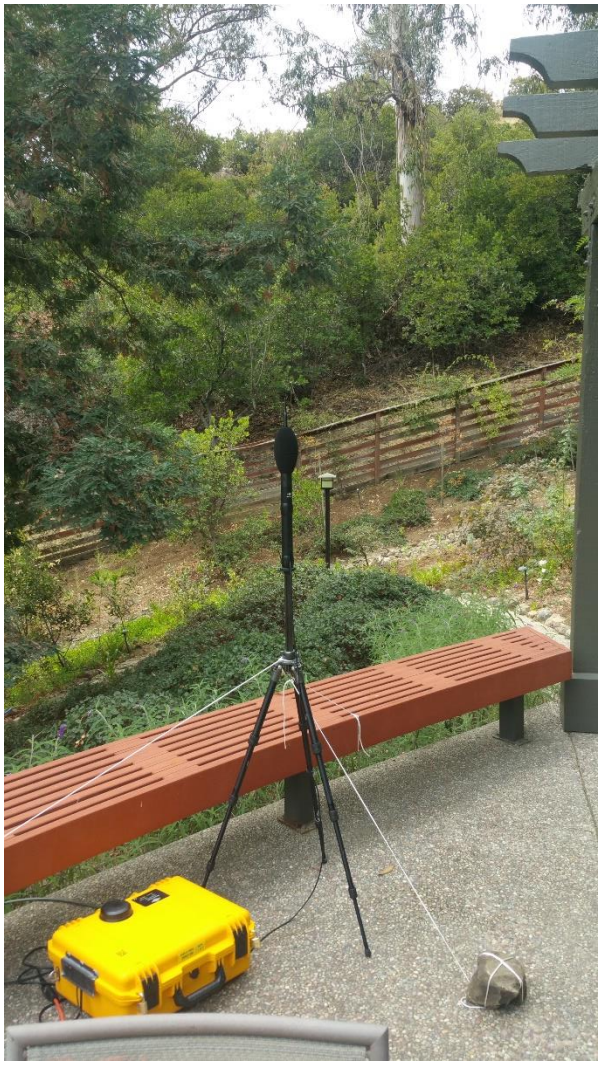

Figure 3-2: Photo of Noise Monitor at Voss Street

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4.0 Observations

4.1 Weather

From October 3 to 28, 2016, the maximum wind speed was 24 miles per hour (mph), with an average speed of 5 mph; wind noise generally did not affect the measurement (there were a couple night where wind noise did affect the measurements, which we ignored). The temperature ranged from a low of 49°F to a high of 88°F, while the average was 64°F. The humidity ranged from a low of 16% on October 8 to a high of 100% from October 15 to 16, while averaging 64%. It rained from October 14 to 16 for a total of one inch, and again from October 27 to 28 for another total of one inch. The data from the rainy nights was ignored.

4.2 General Noise Conditions

Crickets, wildlife, periodic aircraft flyovers, and suburban noises (e.g., music from inside the houses, people talking), were the primary contributors to the ambient nighttime noise environment. Road traffic and background "hum" from the Plant were minor contributors to the overall nighttime noise levels. The specific nature of these noises, as well as those that were above the County's noise standards, are described in Section 6.0 below.

5.0 Data Analysis Methodology

At the start of the monitoring, the City asked residents to log the time and description of any noise heard from the cement plant. At the conclusion of the monitoring period, the City only received a couple logs from the residents, and the only time that the cement plant noise was noted as audible was during the daytime. Unfortunately, the audio recording functionality was only enabled during the nighttime hours so we could not listen to the daytime sounds. In addition, other ambient sources such as traffic noise dominate during the daytime. As a result, the log data was not usable, so we utilized the following analysis methodology.

To determine which activity took place at the time the noise standards were exceeded, we compared the time history graphs[2] from the field measurements to the noises that dominated when listening to the audio recordings. We then notated the various time history graphs, characterizing the primary and secondary noise sources. The tables presented in Section 6.0 show the results of the analysis.

6.0 Results

Ambient noise levels at the Voss Avenue location were generally higher than the Firwood Drive location. We have summarized the results at each measurement location in the following sections. The noise levels in the tables show both the range of measured noise levels (stripping out any short-term, atypical noisy events such as loud motorcycles or sirens),[3] as well as an average level (L_{eq}) for the same time period. In Section 6.3, we have presented time history graphs showing the noise level during times when cement plant noise was clearly audible.

[2] Time history graph: A graph showing the fluctuating noise level over time.
[3] The range of noise levels presented in the table show the range between the L_{95} (all noise levels except the quietest 5%) and the L_{10} (all noise levels except the loudest 10%). This effectively strips out atypical quiet noise levels such as periodic lulls in Hwy 280/SR 85 traffic noise and noisy events such as sirens or loud motorcycles.

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6.1 10160 Firwood Drive

6.1.1 Notes

The measurement was taken on a tripod six feet above the ground, and more than 10 feet from any reflecting vertical surface. The measurement commenced at 12:00 PM on October 3, 2016, and ended at 10:00 AM on October 28, 2016.

The equipment was calibrated immediately before and after the measurement with no significant drift in response.

6.1.2 Observations

Typical noises included crickets, road traffic, and aircraft flyovers. Cement plant noise was typically faintly audible during the late night/early morning hours. There were some times when the cement plant noise was clearly audible. These instances are graphed in Section 6.3 of the report and audio links are provided.

6.1.3 Measured Levels

Table 6-1: 10160 Firwood Drive – Nighttime Measured Levels (10 PM to 7 AM)

Start Date	Range (dBA)	L_{eq} (dBA)	Dominant Noise(s)	Start Date	Range (dBA)	L_{eq} (dBA)	Dominant Noise
October 3	35 to 46	41	Crickets, cement plant at times	October 16	33 to 48	42	Rain
October 4	30 to 45	40	Crickets	October 17	31 to 45	40	Crickets
October 5	35 to 45	42	Crickets	October 18	35 to 44	41	Crickets
October 6	35 to 44	41	Crickets	October 19	33 to 45	43	Crickets
October 7	35 to 47	43	Crickets	October 20	35 to 44	42	Crickets
October 8	33 to 46	42	Crickets	October 21	32 to 44	38	Crickets
October 9	31 to 45	41	Crickets	October 22	29 to 44	37	Crickets
October 10	28 to 42	37	Crickets	October 23	38 to 49	44	Crickets
October 11	27 to 42	36	Crickets	October 24	34 to 47	42	Crickets
October 12	30 to 43	39	Crickets	October 25	33 to 44	40	Crickets
October 13	37 to 44	42	Crickets	October 26	31 to 41	40	Crickets
October 14	30 to 41	37	Crickets	October 27	39 to 50	47	Rain
October 15	36 to 50	46	Rain				

For the date where the cement plant is noted as audible, noise from the plant did not exceed the County's noise ordinance. This is due to the ambient noise level (from crickets) being at or above the cement plant noise level. As per the Ordinance, if the ambient noise level is higher than the noise limits presented in Table 3-1 then the noise limits are raised in 5 dB increments. Please see Section 6.3 which contains graphs showing the time history along with links to the audio files.

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6.2 23022 Voss Avenue

6.2.1 Notes

The measurement was taken on a tripod 6 feet above the ground and more than 10 feet from any reflecting vertical surface. The measurement commenced at 2:00 PM on October 3, 2016, and ended at 10:00 AM on October 28, 2016.

The equipment was calibrated immediately before and after the measurement with no significant drift in response.

6.2.2 Observations

Typical noises included crickets, wildlife (e.g., owls), road traffic, and periodic aircraft flyovers. In general, the cricket noise levels were louder (likely due to the larger amount of open space) than at Firwood Drive. There were some times when the cement plant noise was clearly audible. These instances are graphed in Section 6.3 of the report and audio links are provided.

6.2.3 Measured Levels

Table 6-3: Voss Avenue – Nighttime Measured Levels (10 PM to 7 AM)

Start Date	Range (dBA)	L_{eq} (dBA)	Dominant Noise (s)	Start Date	Range (dBA)	L_{eq} (dBA)	Dominant Noise
October 3	32 to 47	45	Crickets, cement plant (minor) at times	October 16	32 to 49	42	Rain
October 4	31 to 51	43	Crickets	October 17	28 to 47	39	Crickets
October 5	31 to 50	45	Crickets	October 18	33 to 47	43	Crickets
October 6	35 to 52	47	Crickets	October 19	34 to 47	43	Crickets
October 7	33 to 51	47	Crickets	October 20	36 to 50	45	Crickets
October 8	33 to 53	48	Crickets	October 21	30 to 45	40	Crickets
October 9	36 to 51	45	Crickets	October 22	29 to 40	36	Crickets
October 10	30 to 49	44	Crickets	October 23	36 to 48	44	Crickets
October 11	29 to 50	44	Crickets, cement plant at times	October 24	34 to 47	41	Crickets
October 12	29 to 46	40	Crickets	October 25	33 to 45	41	Crickets
October 13	36 to 49	45	Crickets	October 26	34 to 42	39	Crickets
October 14	30 to 47	42	Crickets	October 27	33 to 46	43	Rain
October 15	31 to 45	42	Rain				

For the dates where the cement plant is noted as audible, noise from the plant did not exceed the County's noise ordinance. This is due to the ambient noise level (from crickets) being at or above the cement plant noise level. As per the Ordinance, if the ambient noise level is higher than the noise limits presented in Table 3-1 then the noise limits are raised in 5 dB increments. Please see Section 6.3 which contains graphs showing the time history along with links to the audio files.

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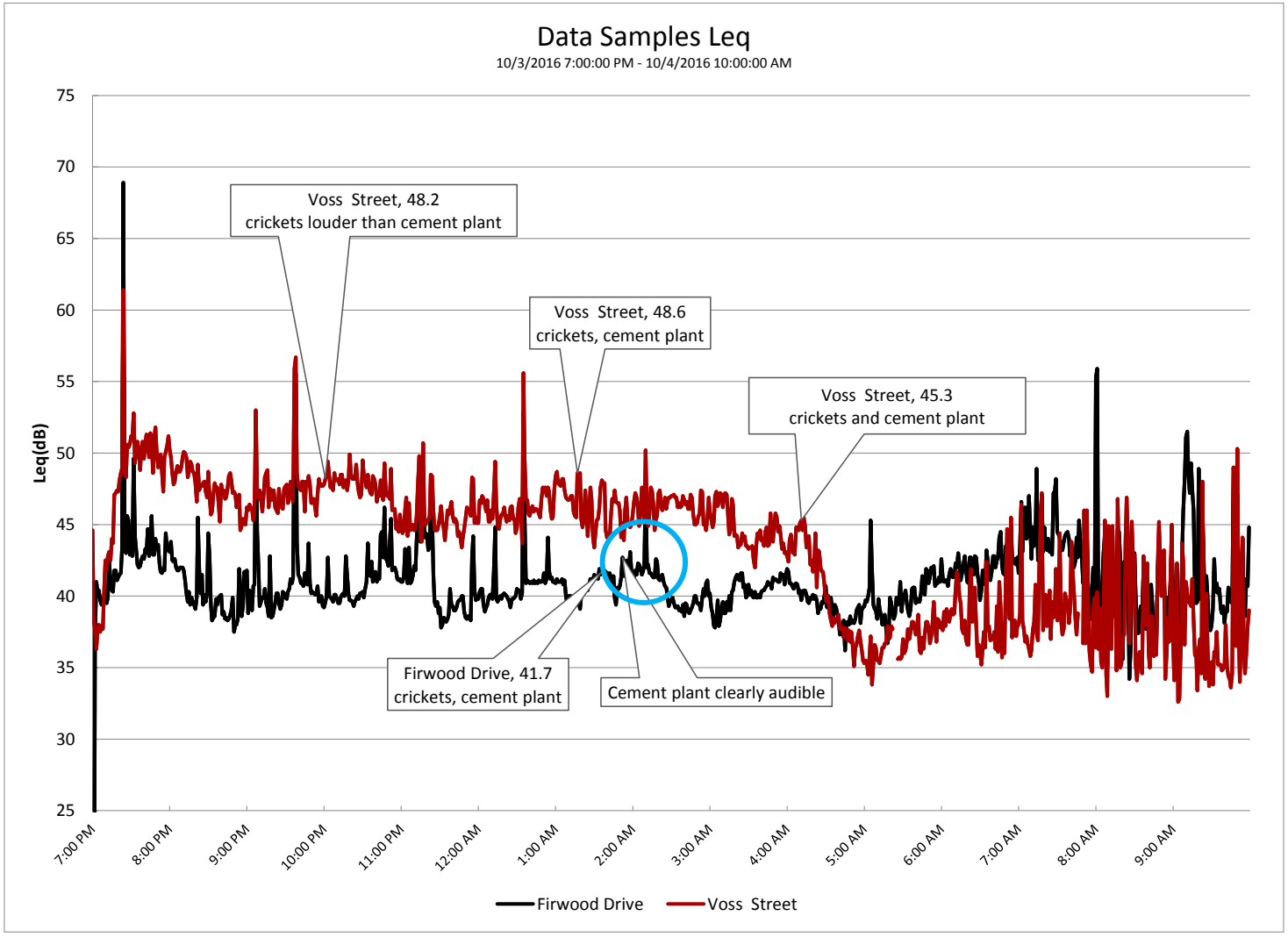
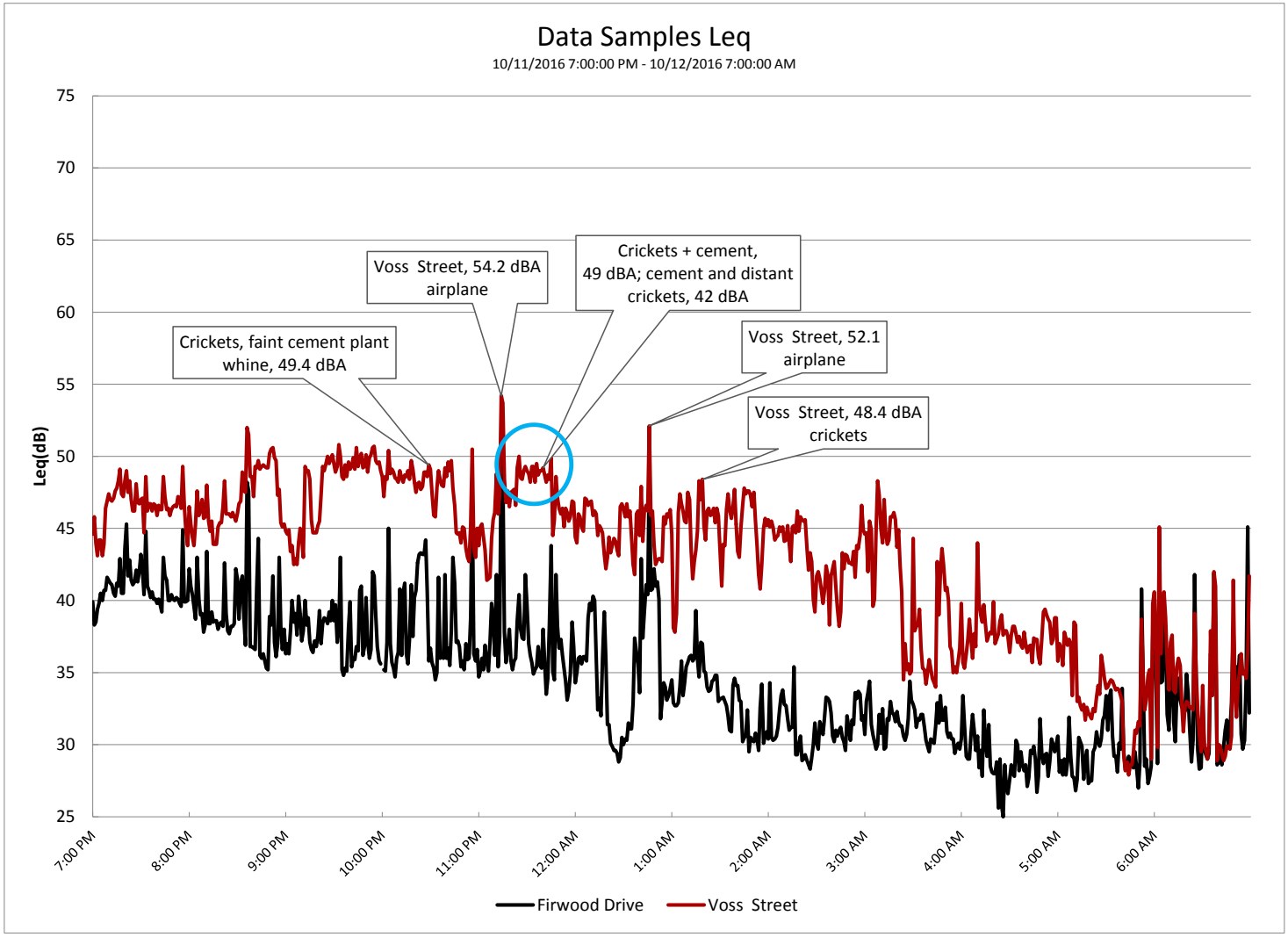
6.3 Time History Graphs

6.3.1 October 3-4



Note: Blue circle represents time when the cement plant was clearly audible; minute 27-55 of the following audio file: Link to Audio File

6.3.2 October 11-12



Note: Blue circle represents time when the cement plant was clearly audible; minutes 37 and 40 of the 11:00 PM file have periods of time when crickets stopped and cement plant was clearly audible. Sound level when crickets stop is ~42 dBA. Link to Audio File.

This concludes our noise monitoring report for the Lehigh Cement Plant measurements conducted during October of 2016.

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