

APPENDIX 5.12-A

PROJECT NOISE ANALYSIS: ARTESIAN SUBSTATION

FINAL

PROJECT NOISE ANALYSIS

Artesian Substation

B&V PROJECT NO. 188602

PREPARED FOR



San Diego Gas & Electric

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Executive Summary

San Diego Gas & Electric (SDG&E) plans to relocate and expand the existing Artesian Substation located at 16010 Camino Del Sur, San Diego, California. Based on available substation design information and drawings, the existing 69/12 kV yard will be relocated and expanded and a new 230/69 kV yard will be installed. The ultimate build out of the future Artesian Substation (Substation) will include one (1) 230/69 kV transformer, four (4) 69/12 kV transformers, four (4) switchgear line-ups, and a control shelter.

Noise regulations and standards specified by the City of San Diego and State of California were reviewed to determine applicability. In accordance with the California Environmental Quality Act (CEQA) if a project has a potentially significant impact to the existing acoustical environment, mitigation measures must be considered.

The City of San Diego Noise Ordinance limits sound pressure levels based on the zoning designations of the emitting and receiving land and time of day. Based on available zoning maps the lowest applicable limits are those established for the multi-family residential (emitter) to the multi-family residential (receiver) zoning designations. As such, to ensure compliance with the City of San Diego Noise Ordinance the sound levels associated with the Substation should not exceed 45 dBA along the south boundary. Since the south boundary represents the most stringent regulatory requirement, a Substation design that results in regulatory compliance along the south boundary is expected to result in compliance along all Substation property boundaries.

An acoustical model was developed in accordance with ISO 9613 to predict the post construction sound levels due solely to the Substation. Predicted Substation sound pressure levels along the southern property boundary are anticipated to be as high as 45 dBA. Therefore, the Substation sound levels are expected to comply with the City of San Diego multi-family residential noise limit of 45 dBA. Accordingly, based on the current design elements, no noise mitigation strategies are deemed necessary for the Substation in order to support compliance with the applicable noise regulations.

In addition to regulatory compliance, the Substation was also evaluated based on potential impacts to the nearby noise-sensitive receptors. Once operational the increase to the ambient sound level due to the Substation is expected to be less than 5 dB. Therefore, the Substation will cause an insignificant impact at neighboring noise-sensitive receptors and will support alignment with the CEQA guidelines.

1.0 Introduction

San Diego Gas & Electric (SDG&E) is proposing to relocate and expand the existing Artesian Substation located at 16010 Camino Del Sur, San Diego, California. Based on available substation design information and drawings, the existing 69/12 kV yard will be relocated and expanded and a new 230/69 kV yard installed. The ultimate build out of the future Artesian Substation (Substation) will include one (1) 230/69 kV transformer, four (4) 69/12 kV transformers, four (4) switchgear line-ups, and a control shelter. For reference an aerial view of the existing Artesian Substation and surrounding vicinity is shown in Figure 1-1.

In support of the Substation, a project noise analysis has been conducted to address the following questions:

- What noise regulations are applicable to the Substation?
- What are the expected environmental noise emissions associated with the Substation?
- What (if any) noise mitigation measures are anticipated to be required for the Substation to comply with the applicable noise regulations?



Figure 1-1 Aerial view of the existing Substation and adjacent properties.

2.0 Applicable Environmental Noise Regulations

Regulations, standards, and guidelines related to environmental noise emissions were investigated and reviewed to determine the applicability to the Substation. The following sections summarize the noise regulations established by State of California and the City of San Diego and the applicability of each.

2.1 STATE OF CALIFORNIA

2.1.1 California Government Code

California Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of their comprehensive general plan. The local noise element must recognize the land-use compatibility guidelines established by the State Department of Health Services.

2.1.2 California Environmental Quality Act

The California Environmental Quality Act (CEQA)¹ was enacted in 1970 and requires that all known environmental effects of a project be analyzed, including the environmental noise impacts. Under CEQA, a project has a potentially significant impact if it exposes people to noise levels in excess of standards established in the local general plan or noise ordinance. Additionally, under CEQA, a project has a potentially significant impact if it creates a substantial increase in the ambient noise levels in the project vicinity above levels existing without the project. If a project has a potentially significant impact, mitigation measures must be considered. If mitigation measures to reduce the impact to less than significant are not feasible due to economic, social, environmental, legal, or other conditions, the most feasible mitigation measures must be considered.

2.2 CITY OF SAN DIEGO

The Substation is located within the City of San Diego and therefore must comply with the City of San Diego Municipal Code (§59.5.04). The City's Noise Ordinance limits sound pressure levels based on the zoning designations of the emitting and receiving land and time of day. For reference, the §59.5.04 noise limits for each zoning designation are provided in Table 2-1.

These limits apply on and beyond the boundaries of the property on which the noise is produced and are based on one-hour average sound pressure levels. While not explicitly identified it is assumed the limits are A-weighted sound levels. Additionally, for those boundaries that are between two zoning districts, the applicable limit is the arithmetic mean of the respective limits for the two districts.

Table 2-1 Noise Limits per the City of San Diego

ZONING	TIME OF DAY	ONE-HOUR AVERAGE SOUND LEVEL , dBA
Single Family Residential	7 AM to 7 PM.	50
	7 PM to 10 PM	45
	10 PM to 7 AM	40
Multi-Family Residential	7 AM to 7 PM.	55

¹ California Environmental Quality Act Statutes and Guidelines, Governor's Office of Planning and Research, State of California, 2001.

ZONING	TIME OF DAY	ONE-HOUR AVERAGE SOUND LEVEL, dBA
	7 PM to 10 PM	50
	10 PM to 7 AM	45
All other Residential	7 AM to 7 PM.	60
	7 PM to 10 PM	55
	10 PM to 7 AM	50
Commercial	7 AM to 7 PM.	65
	7 PM to 10 PM	60
	10 PM to 7 AM	60
Industrial or Agricultural	Anytime	75

In accordance with the City of San Diego Geographic Information Source website (<http://www.sangis.org/>, accessed on June 23, 2015) the Substation is a mixed-zone property which includes multi-family (RM-2-6), agricultural (AR-1-1), and commercial (CC-1-3) zoning districts as shown in Figure 2-1. Properties directly adjacent to the Substation are similarly zoned multi-family, agricultural, and commercial. As such, the lowest applicable limits are those established for the multi-family residential (emitter) to the multi-family residential (receiver) zoning designations along the southern boundary. Since the south boundary represents the most stringent regulatory requirement, a Substation design that results in regulatory compliance along the south boundary is expected to result in compliance along all Substation property boundaries. Additionally, since the Substation will operate during both daytime and nighttime hours the more restrictive nighttime (10 PM to 7 AM) limit will apply. Therefore, to ensure compliance with the City of San Diego Noise Ordinance the sound levels associated with the Substation should not exceed 45 dBA along the south boundary depicted in Figure 2-1.

2.3 EXISTING ACOUSTICAL ENVIRONMENT

SDG&E provided the results of an ambient survey which details the existing acoustical environment measured at the Substation on 18 and 19 May, 2015. The complete Artesian Substation Survey Overview is provided in Appendix A. As detailed in this summary, ambient sound levels at the nearest noise sensitive receptor (multi-family property south of the Substation) were measured over a 24-hour period with hourly background (L_{90}) sound pressure levels ranging from 38 dBA to 56 dBA. Existing noise sources included vehicular traffic noise and natural sounds such as insects, wind, and birds.

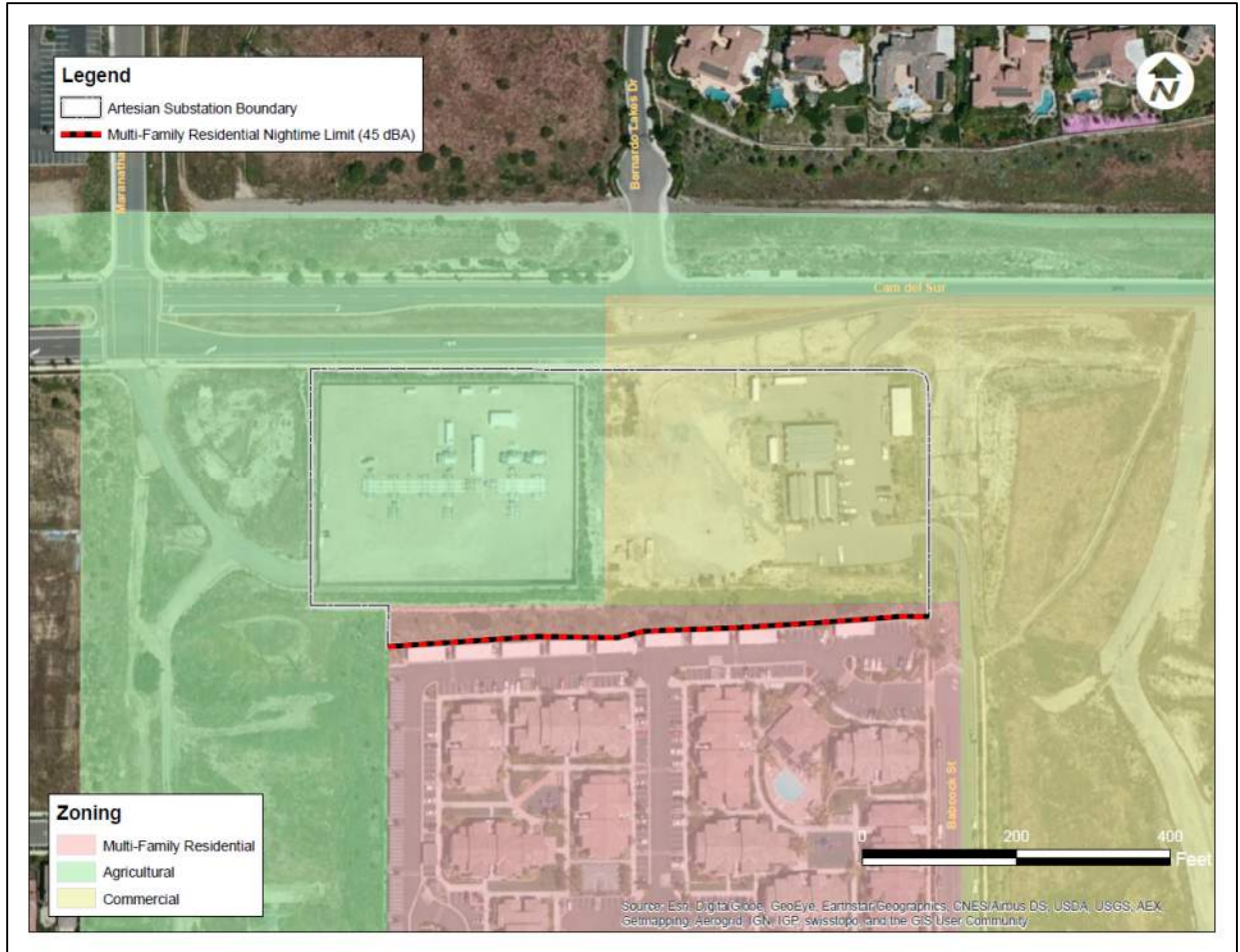


Figure 2-1 City of San Diego Zoning Designations and Multi-Family Residential Compliance Limit.

3.0 Substation Environmental Noise Emissions

The environmental noise emissions from the Substation (after expansion) have been predicted in order to evaluate future compliance with the applicable noise regulations. The Substation noise emissions are based on the site arrangement drawing (Appendix B) provided by the Substation design team.

3.1 SUBSTATION NOISE MODELING

The environmental noise emissions associated with the Substation have been modeled using noise prediction software (DataKustick Cadna/A version 4.5.151), which implements the calculations methodologies specified in ISO 9613. The model simulated the outdoor propagation of sound from each noise source and accounted for sound wave divergence, atmospheric and ground sound absorption, sound directivity, and sound shielding due to interceding barriers (masonry screen wall), buildings, and terrain. A database was developed which specified the location, and octave-band sound levels of each noise source. A receptor grid was specified which covered the entire area of interest. The sound pressure levels within the receptor grid were calculated based on the octave-band sound level contribution of each noise source. Finally, a noise contour plot was produced based on the overall sound pressure levels within the receptor grid, including at specific receptor locations.

Noise modeling was based on normal operation which excludes any abnormal or upset operating conditions. Facility structures associated with the Substation were included in the model as structures to account for their shielding effect. A three-dimensional view of the noise model is shown in Figure 3-1.

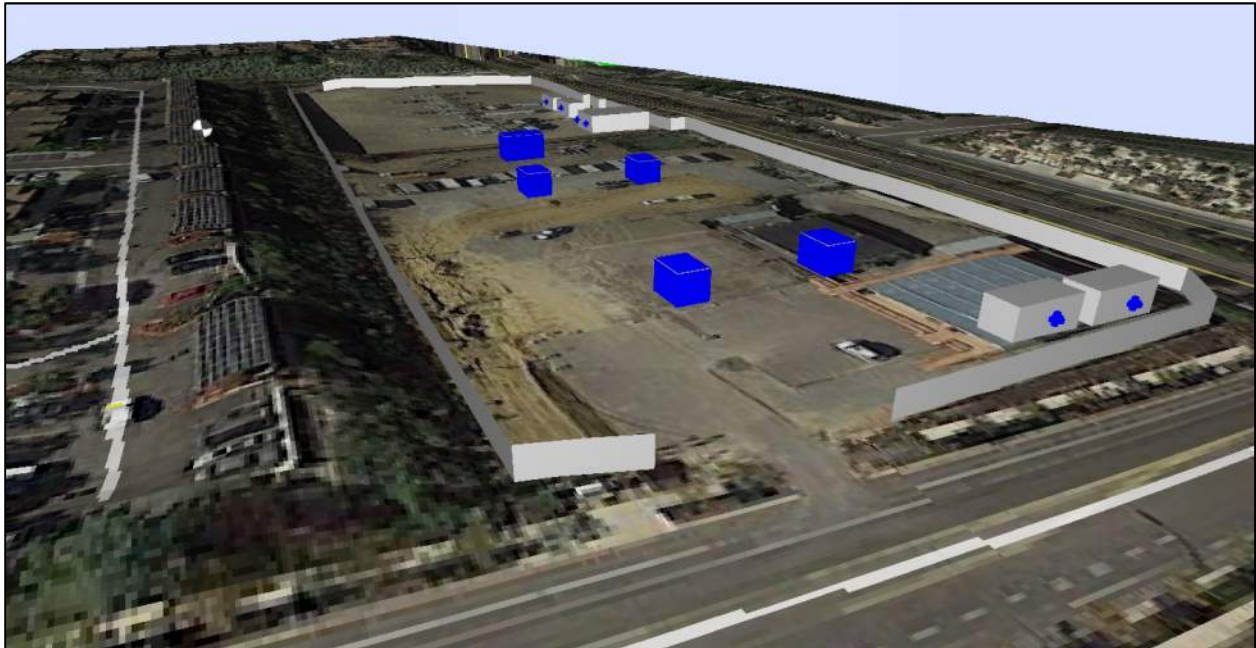


Figure 3-1. CadnaA 3D view of the Substation looking to the northwest.

3.2 SUBSTATION EQUIPMENT SPECIFICATIONS

The ultimate build out of the Substation will include one (1) 230/69 kV transformer, four (4) 69/12 kV transformers, and HVAC equipment associated with the four (4) switchgear line-ups and control shelter. Sound levels used to develop the acoustical model are shown in Table 3-1 and are based on data provided by SDG&E, and in-house and empirical data from similar equipment.

Please note that any deviations from the current site arrangement, the equipment specifications, or the acoustical design elements outlined herein may affect the overall Substation noise emissions. If such design or specification changes occur, the Substation noise emissions should be re-evaluated to determine the impacts of the proposed design change.

Table 3-1 Substation Equipment Sound Levels

EQUIPMENT	QTY	EQUIPMENT SOUND LEVELS	SOURCE
230/69 kV transformer	1	71 dBA per IEEE C57.12.90	SDG&E
69/12 kV transformers	4	61 dBA per IEEE C57.12.90	SDG&E
5-ton HVAC Unit (Control Building)	2	65 dBA @ 10 ft	In-house ¹
5-ton HVAC Unit (Switchgear line-up)	4	65 dBA @ 10 ft	In-house ¹

Notes:

1. In-house data is based on a combination of measured data of similar substation installations and information received from past equipment suppliers.

3.3 NOISE EMISSIONS – REGULATORY COMPLIANCE

The resulting noise emissions associated with the Substation are presented in Figure 3-2 as noise contours. The noise contours represent the overall A-weighted sound pressure levels at 5 dB intervals. It is important to note that the calculated noise emissions only include noise from the Substation and are exclusive of any background noise. Also, the Substation noise emissions do not include noise associated with site development or construction. As shown in Figure 3-2, the predicted Substation sound pressure levels along the southern property boundary are anticipated to be as high as 45 dBA. Therefore, the Substation sound levels are expected to comply with the City of San Diego multi-family residential noise limit of 45 dBA. Accordingly, based on the current design elements, no noise mitigation strategies are deemed necessary for the Substation in order to support compliance with the applicable noise regulations.

3.4 NOISE EMISSIONS – POTENTIAL IMPACTS

In addition to regulatory compliance, the Substation has been evaluated based on potential impacts to the nearby noise-sensitive receptors. In order to minimize the possible likelihood of noise complaints associated with Substation operation, the future ambient sound level increases due to the project should be minimized. Based on California Environmental Quality Act (CEQA) guidelines, a project would be deemed to cause a significant impact if the project noise emissions result in a substantial permanent increase in ambient sound levels in the project vicinity. For reference, a

sound level increase of less than 5 dB is typically considered less than perceptible while an increase of greater than 5 dB is typically considered clearly perceptible.

As shown in Table 3-2, the sound level increase at the nearest noise-sensitive receptor (multifamily property to the south) as a result of the Substation is expected to be less than 5 dB. As such, the Substation noise emissions are expected to cause a less than significant impact at neighboring noise-sensitive receptors.

Table 3-2 Potential Ambient Sound Level Increase due to the Substation

MEASUREMENT LOCATION	MEASURED HOURLY L ₉₀ AMBIENT SPL, dBA	SUBSTATION SPL AT NEAREST NOISE SENSITIVE RECEPTOR, dBA	FUTURE SUB. SPL (AMBIENT + PROJECT), dBA	POTENTIAL INCREASE, dB	TYPE OF IMPACT
Substation Southern Boundary	38 -56	40	42 - 56	0 - 4	<u>Insignificant</u> ≤5 dB increase



Figure 3-2 Substation (only) sound pressure levels.

Appendix A. Artesian Substation Survey Overview

Artesian Substation Survey Overview

The Artesian Substation site and surroundings were visited May 18-19, 2015. Long-term ambient noise level measurements were conducted to capture sound levels over a 24 hour period. The sampling location was chosen south of the substation, near the closest noise-sensitive receptors (residences). The long-term measurement location at the Artesian Substation is shown in Figure 4.12-1, Ambient Noise Measurement Locations.

A RION NL-21 integrating sound level meter was utilized for continuous 24-hour monitoring. The meter meets the requirements for ANSI S1.4-1983 Type 2 or better sound level meters. The meter microphone was fitted with a windscreen in order to reduce wind generated noise, and was programmed to measure and store data in 10-minute increments during the period. The data set was tabulated into hourly averages and is presented in Table 4.12-5: Summary of Hourly Background Measured Ambient Noise Levels (dBA). Existing noise sources in the area included vehicular traffic noise and natural sounds such as insects, wind, and birds.

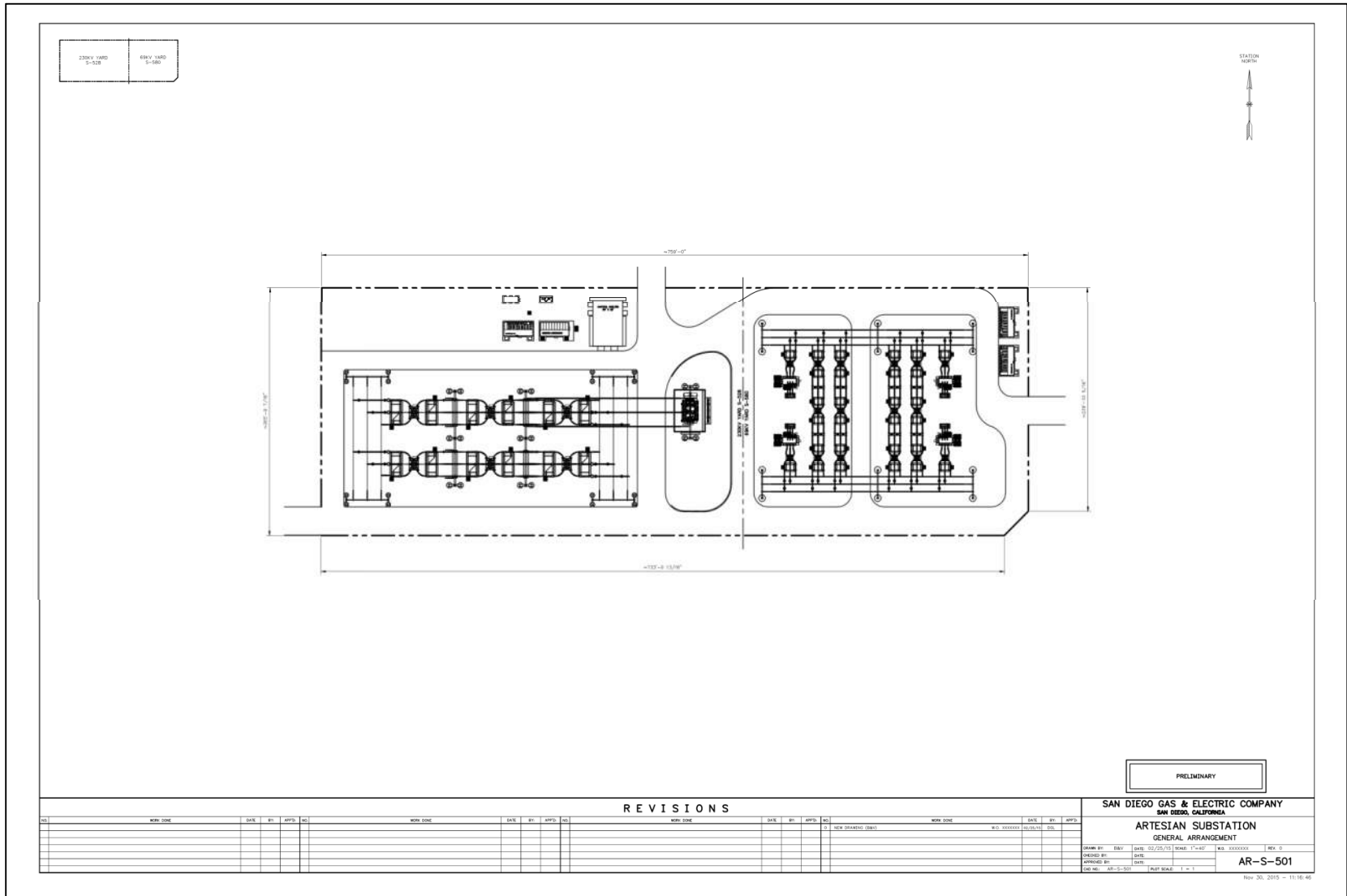
Table 4.12-5: Summary of Hourly Background Measured Ambient Noise Levels (dBA)

Date	Hour Ending	L _{eq}	L ₉₀	L ₁₀
May 18, 2015	12	50.3	42.4	53.5
	13	49.8	43.3	51.6
	14	48.9	42.8	50.7
	15	54.2	44.4	54.4
	16	55.3	45.2	57.2
	17	50.7	44.6	53.3
	18	51.1	45.1	53.7
	19	52.3	43.8	53.7
	20	51.1	42.3	51.9
	21	46.9	38.5	49.5
	22	56.8	56.0	57.4
	23	53.1	52.2	54.3
May 19, 2015	24	50.1	49.0	49.9
	1	47.5	46.8	47.5
	2	45.1	44.7	45.4
	3	43.1	42.5	43.0
	4	42.5	40.7	41.2
	5	40.5	38.7	42.5
	6	44.4	38.4	47.5
	7	48.2	42.2	50.2
	8	50.0	45.0	52.5
	9	53.3	44.8	55.6
	10	55.8	42.1	56.4
	11	49.4	41.6	51.4
	Maximum	56.8	56.0	57.4
	Minimum	40.5	38.4	41.2

Measured L_{eq} sound levels generally ranged from 48 dBA to 56 dBA during the day, dropping to the lowest measured hourly sound level of 40.5 dBA during the early morning hours. The measured levels are typical of suburban areas.



Appendix B. Substation General Arrangement Drawing



Appendix C. Ultimate Substation Configuration and Noise Mitigation Requirements

The ultimate substation arrangement requires the addition of a 2nd 230/69kV transformer and the addition of that transformer will require noise mitigation to ensure the Substation complies with the City of San Diego noise regulations. A mitigation analysis has been completed focusing on the 230/69 kV transformers as these were identified as the primary contributors along the Multi-Family Residential boundary. All other components would remain as detailed in Section 3.0.

Noise Mitigation – Noise Barrier Wall

In order to mitigate the 230/69 kV transformer noise emissions, barrier walls were considered for each transformer. The minimum acoustical requirements for the barrier walls are as follows:

- The layout of each wall is shown in Figure B-1 (blue lines). The dimensions of each wall has been optimized to ensure the Substation noise emissions comply with the most restrictive nighttime Multi-Family Residential limit (45 dBA) established by the City of San Diego. Please note that the exact design and placement of the noise barrier walls may need to be refined further to address any structural and/or electrical clearance issues identified by the Project team.
- The barrier walls should be constructed of materials that have a minimum surface weight of 4 pounds per square foot (lb/ft² or psf). Examples of materials that would meet these requirements include:
 - Poured concrete
 - Concrete panels
 - Concrete masonry blocks, including “acoustical” blocks
 - Metal panels, including “acoustical” panels
- The barrier walls should not have any air spaces between panels, columns, structural members, or between the bottom of the barrier and the ground.

As shown in Figure B-2, with the noise barrier walls the predicted sound levels associated with the ultimate Substation configuration are not expected to exceed 42 dBA. Therefore, with noise barrier walls, the ultimate Substation configuration is expected to comply with the noise limits set forth in the City of San Diego Municipal Code.

Additionally, with the above mitigation the sound level increase at the nearest noise-sensitive receptor (multifamily property to the south) as a result of the ultimate substation configuration is expected to be less than 5 dB. As such, the ultimate substation noise emissions are expected to cause a less than significant impact at neighboring noise-sensitive receptors.

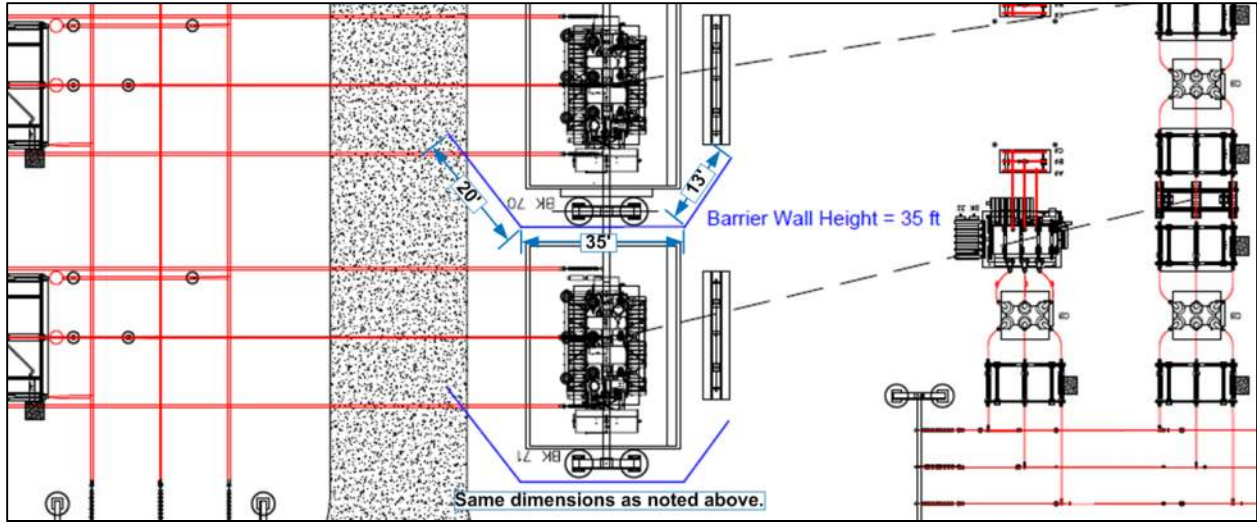


Figure B-1 Mitigation Alternative - Noise barrier wall arrangement



Figure B-2 Ultimate Substation Configuration sound pressure levels with noise barrier wall mitigation.

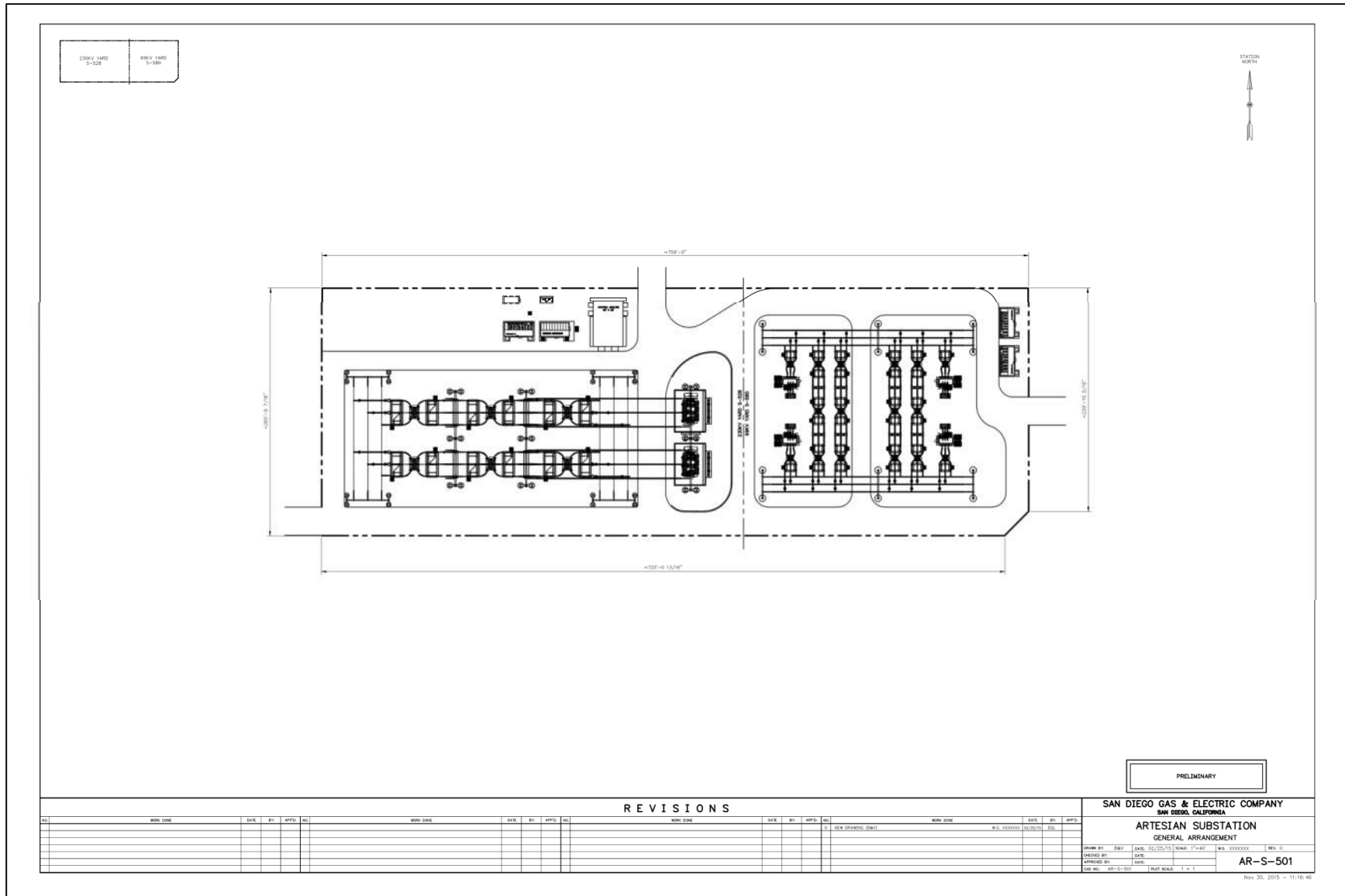


Figure B-3 Ultimate Substation Configuration