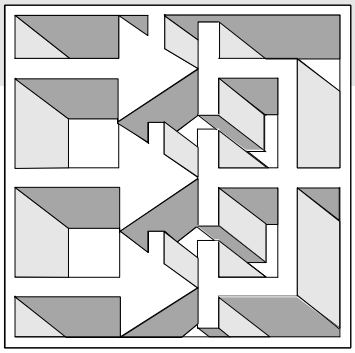
Trans Bay Cable Project (400 MW)



Preliminary Audible Noise Study

Potrero Westerly HWC Site

Rev.	Date	Section	Page	Remarks	Signature
0	17.11.06	all	all	first issue	
1	13.12.06	1.1.1, 1.4.1, Fig. 1.1, Fig. 1.2, Fig. 1.3	2, 3, 4, 5	mirrored layout, protection walls	

1 Audible Noise Study

1.1 Basis

The following report outlines the basis of the audible noise study and how the preliminary audible noise levels at the Potrero Westerly Converter Station have been calculated for the HVDC PLUS technology.

1.1.1 Basis of Acoustical Sound Prediction Calculation

The simplified basic formula of acoustical calculation is:

$$L_{AT}(LT) = L_{WA} + D_c - A_{div} - A_{atm} - A_{gr} - A_{bar} - A_{misc} - C_{met}$$

The symbols mean (according to DIN EN ISO 9613-2):

$L_{AT}(LT)$: long-term average A-weighted sound pressure level
L_{WA} : A-weighted sound power level of the sound source
D_c : correction for directivity of the source
A_{div} : attenuation due to the geometrical divergence
A_{atm} : attenuation due to air absorption
A_{gr} : attenuation due to ground effects
A_{bar} : the attenuation due to screening (including buildings, land contours, barriers, noise screens, retaining walls and cuttings)
A_{misc} : the attenuation due to other miscellaneous effects (e.g. dense foliage, industrial sites)
C_{met}: meteorological correction

The sound propagation has been calculated with the computer program “Cadna A”, using the international regulation for noise prediction calculation “ISO 9613-2”. The model describes the sound pressure level at a certain distance from the sound source.
The buildings, fire protection walls and the boundary wall of the station are digitized for the calculation. The building models in the station area are observed as reflectors.
The calculation of the sound power level of the facades of the buildings is in line with VDI 2571.
The sound propagation was determined in octave bands with nominal midband frequencies from 31,5 Hz to 4.000 Hz.
Sound power levels in octave bandwidth levels, distance, heights of imission points and sound sources, walls and reflectors, air absorption, attenuation and reflection caused by walls have been entered into the calculations.
Vegetation has an attenuation effect on sound propagation. However, in this study it was not included because it is assumed that no vegetation is existing at the converter station.
A flat landscape was assumed in the calculation area of the HVDC Station. The neighboring HMR building has been considered as reflector. Other surrounding buildings and structures have not been regarded in the calculation.

1.2 Analysis Methodology

All calculations performed in the program are based on standard noise propagation equations. The program calculates the sound pressure level impact from each source for specified points of receivers. These sound levels are combined to obtain the overall substation sound pressure levels and the overall (A-weighted) sound pressure level for each critical imission. The sound level calculation at each individual location also accounts for the height of the receiver and noise blockage due to any interceding barriers, such as terrain or walls.
The location of the sound sources corresponds to the arrangement of the equipment according to the preliminary station layout of the converter station.

1.3 Audible Noise Level Limits

The allowable audible noise levels are according table 1:

		Potrero
Measuring unit		dB(A), L_{eq} (1 hour)
Limit at property line	dB(A)	75
Receivers at site	dB(A)	n.a.
Ambient noise		not to be considered for limit
Height of measuring / calculation	m	1,5

Tab. 1: Audible noise limits

1.4 Analysis Results

Based on the preliminary layout and preliminary audible noise levels for the respective components the analysis was done for the Westerly HWC converter station site/alternative.

1.4.1 Layout and Analysis Results

The layout and location of sound sources is shown in Fig. 1.1 and Fig. 1.2. The calculated sound pressure at the property lines is indicated in Fig. 1.3. The maximum sound pressure values are calculated as:

	Max. calculated audible noise level [dB(A), L_{eq} (1 hour)]
north property line	58
east property line	60
west property line	48
south property line	57

which is within the limits specified for the property lines and the receivers.

1.4.2 Noise Reduction Measures

Since the calculated sound pressure at the property line is within the limits no noise reduction measures are proposed.

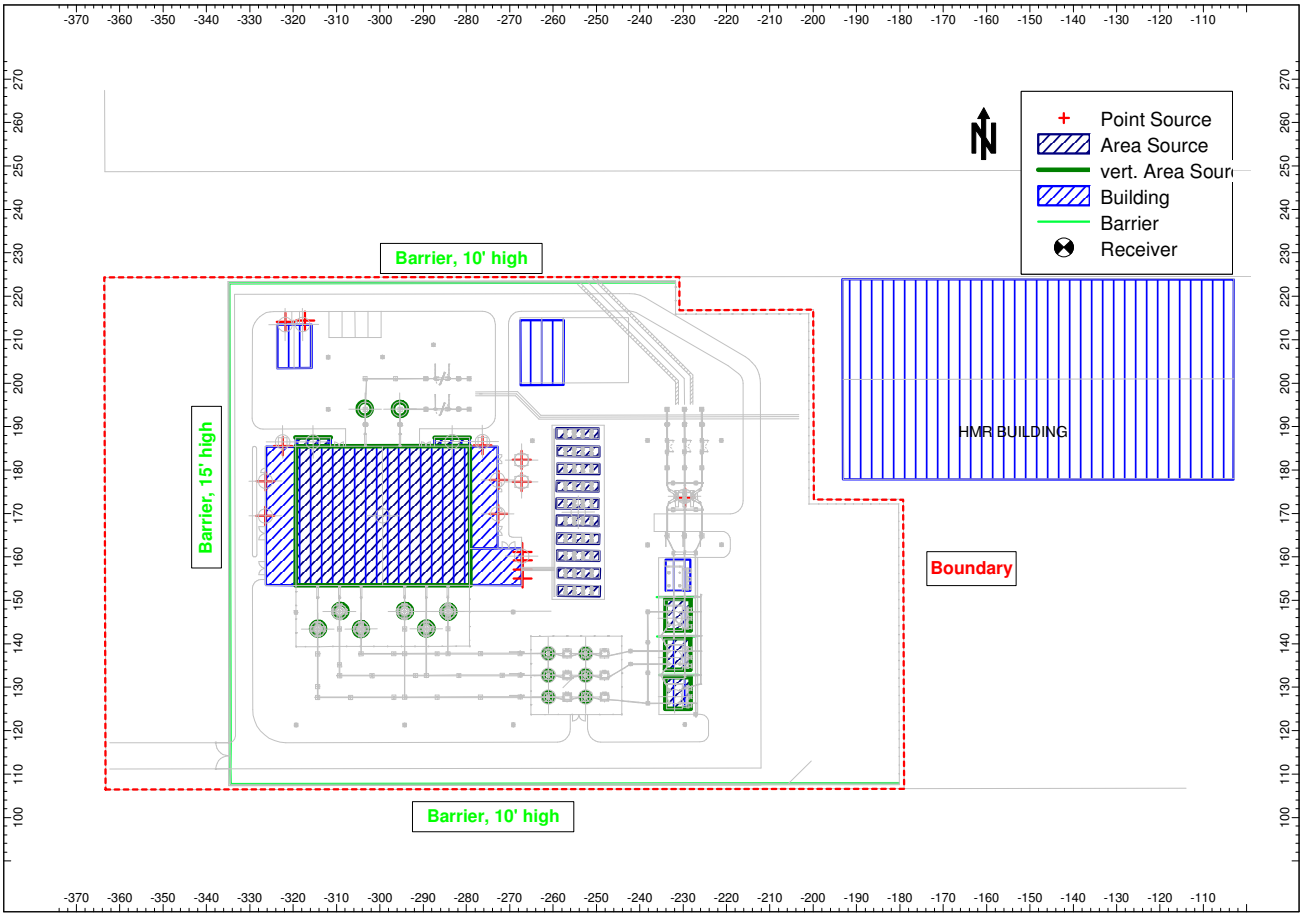


Fig. 1.1: Potrero, HWC Westerly, layout with sound sources

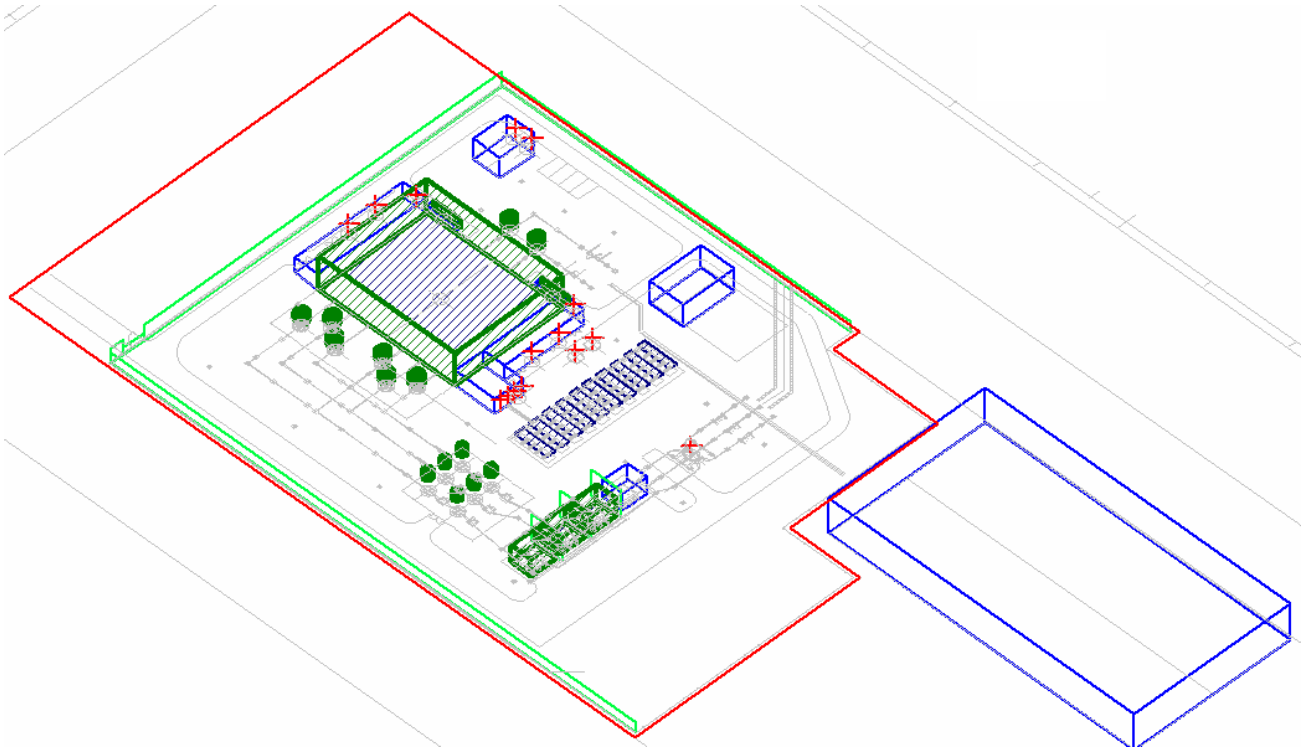


Fig. 1.2: Potrero, HWC Westerly, 3D view

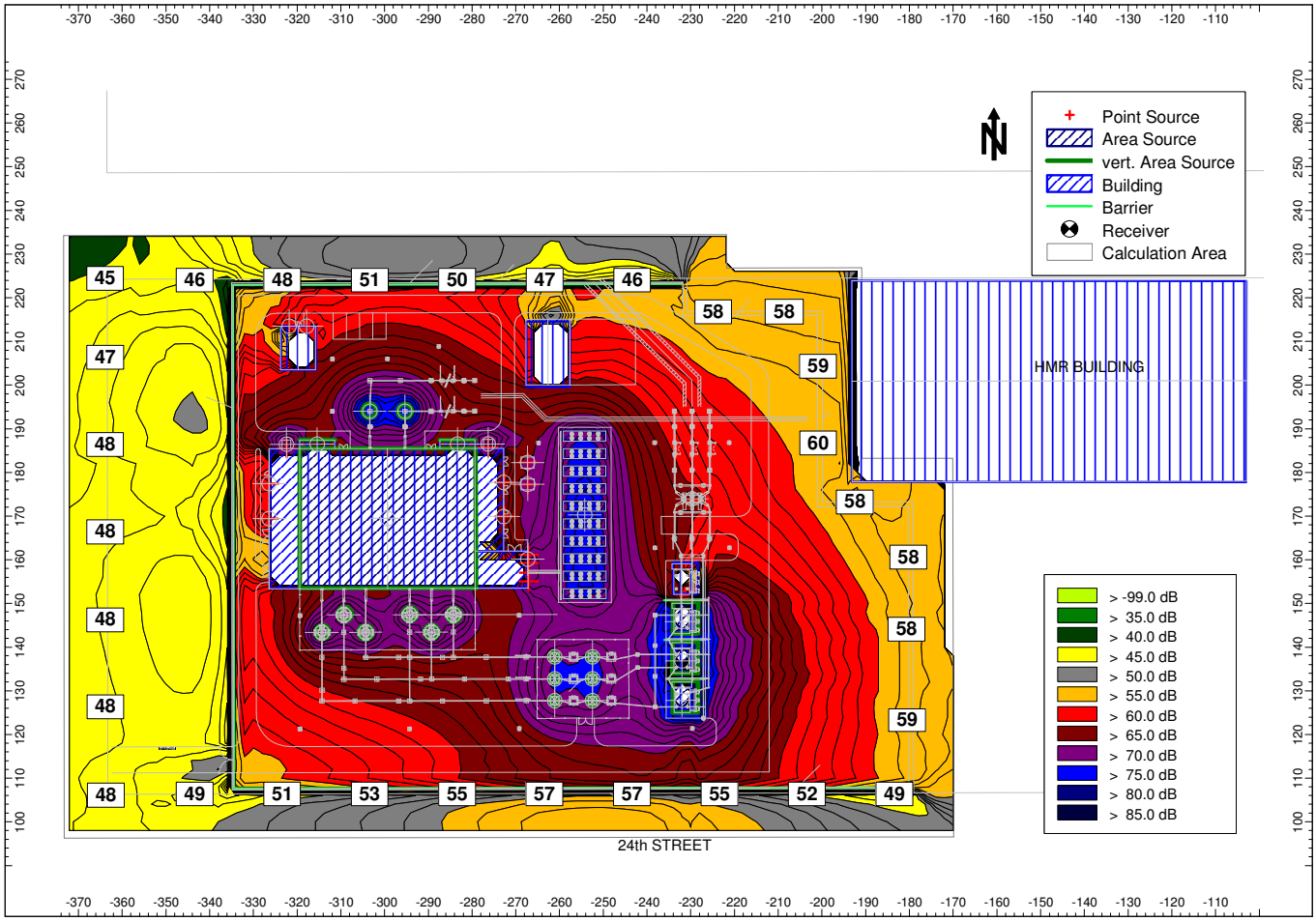


Fig. 1.3: Potrero, HWC Westerly, noise contour map at height of 1,5 m (L_{eq} (1 hour))