APPENDIX F

WATERMAN GARDENS MASTER PLAN PROJECT NOISE ASSESSMENT

Waterman Gardens Master Plan Project

Noise Assessment

Prepared for:

Pyatok Architects, Inc.
1611 Telegraph Avenue, Suite 200
Oakland, CA 94612

Prepared by:

Impact Sciences, Inc.
234 E Colorado Boulevard, Suite 205
Pasadena, CA 91101
Tel: (626) 564-1500
Fax: (626) 564-1501

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SUMMARY

The proposed Waterman Gardens Master Plan Project ("project" or "proposed project") is located at the intersection of Waterman Avenue and Base Line Street in the City of San Bernardino, California. The proposed project would demolish the existing 252 residential unit development and construct approximately 500 residential units and recreational/community facilities. The noise assessment for the proposed project, provides the estimated noise contribution to the existing noise environment from the construction and operation of the proposed project.

Construction of the project result in periodic noise levels that exceed the existing noise levels in the project area. Mitigation of construction noise impacts to a level that is less than significant would be conducted through the enforcement of the San Bernardino Municipal Code and in a broader sense through the policies of the General Plan Noise Element. This assessment recommends that the project incorporate best available control practices, in accordance with the General Plan and industry-standard practices, to control and reduce construction-related noise. With the implementation of these measures and compliance with the San Bernardino Municipal Code, construction noise impacts would be less than significant. During construction, the project would use dozers and haul trucks that would produce some level of groundborne vibrations. However, vibrations during construction would not exceed the threshold of significance.

Operation of the project would result in an incremental increase in noise due to project-related automobiles and trucks. In general, changes in a community noise level of less than 3.0 dB(A) are not typically noticed by the human ear.[1] For the purposes of evaluating the proposed projects' operational noise impacts on human receptors, an increase in the community noise level of 3.0 dB(A) or more from existing noise levels would be considered a significant impact, if the noise levels exceed 65 dB(A). As shown in this assessment, the increase in noise levels would be under 3 dB(A) except along Olive Street where the increase could be 3.5 dB(A), which is above the threshold of human perception. However, noise levels at sensitive receptors along Olive Street are expected to be below the City of San Bernardino noise threshold of 65 dB(A) for noise sensitive uses because of the relatively low traffic volumes. Therefore, this would not be considered a substantial noise increase and the project would result in a less than significant impact during operation. The project would locate future residents on-site that could be exposed to noise levels in excess of 65 dB(A), particularly at residential units construction on-site along Waterman Avenue and Base Line Street. Therefore, impacts to on-site residents are considered potentially significant and mitigation measures are recommended to reduce the impact to less than significant.

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1 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

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1.0 INTRODUCTION

1.1 Project Information

The proposed Waterman Gardens Master Plan Project ("project" or "proposed project") is located at the intersection of Waterman Avenue and Base Line Street in the City of San Bernardino, California. The project site is approximately 38 acres and comprises the San Bernardino Waterman Gardens Public Housing, built in 1943, which includes 252 residential units in 114 buildings (87 single-story duplexes, 24 multi-family townhouses, a management office building, Head Start Facilities, and maintenance facilities).

The proposed project would demolish the existing 252 residential unit development and construct approximately 500 residential units (155 one-bedroom units, 171 two-bedroom units, 158 three-bedroom units, 16 four-bedroom units), a 45,835 square foot recreational facility, a 58,200 square foot community support center, a 4,000 square foot community care facility, a 6,000 square foot Administration and Community room, a 7,000 square foot recycling facility, and a 20,000 square foot shop and youth/jobs training facility.

The project is located in the City of San Bernardino. The location of the project is shown in **Figure 1, Project Site Location**. The City regulates noise in the Noise Element of its General Plan. The City also regulates noise in its Municipal Code (Chapter 8.54 and Chapter 10.56). This assessment provides an analysis of the project's potential to result in significant noise impacts based on thresholds established by the City of San Bernardino. Additional sources of information are relied upon as cited and discussed in this assessment.

1.2 Noise Fundamentals

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary enormously within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called "A-weighting,"

written "dB(A)." The A-weighted sound level is measured on a logarithmic scale such that a doubling of sound energy results in a 3.0 dB(A) increase in noise level.[2] In general, changes in a community noise level of less than 3.0 dB(A) are not typically noticed by the human ear.[3] Changes from 3.0 to 5.0 dB(A) may be noticed by some individuals who are extremely sensitive to changes in noise.[4] A greater than 5.0 dB(A) increase is readily noticeable, while the human ear perceives a 10.0 dB(A) change in sound level to be a doubling or halving sound.[5] Common noise levels associated with certain activities are shown on **Figure 2, Common Noise Levels**.

When assessing community reaction to noise, there is an obvious need for a scale that averages sound pressure levels over time and quantifies the result in terms of a single numerical descriptor. Different types of scales are used to characterize the time-varying nature of sound. Scales that are applicable to this analysis are the Maximum Noise Nevel (Lmax) Equivalent Noise Level (Leq) and the Community Noise Equivalent Level (CNEL). The Lmax is the maximum noise level measured during a specified time period. The Leq is the average A-weighted sound level measured over a given time interval. Leq can be measured over any period, but is typically measured for 1-minute, 15-minute, 1-hour, or 24-hour periods. CNEL is an average A-weighted sound level measured over a 24-hour period. However, this noise scale is adjusted to account for some individuals' increased sensitivity to noise levels during the evening and nighttime hours. A CNEL noise measurement is obtained by adding 5 dB to sound levels occurring during the evening from 7:00 PM to 10:00 PM, and 10 dB to sound levels occurring during the nighttime from 10:00 PM to 7:00 AM. The 5 dB and 10 dB "penalties" are applied to account for increased noise sensitivity during the evening and nighttime hours. The logarithmic effect of adding these penalties to the 1-hour Leq measurements typically results in a CNEL measurement that is within approximately 3 dB(A) of the peak-hour Leq.[6]

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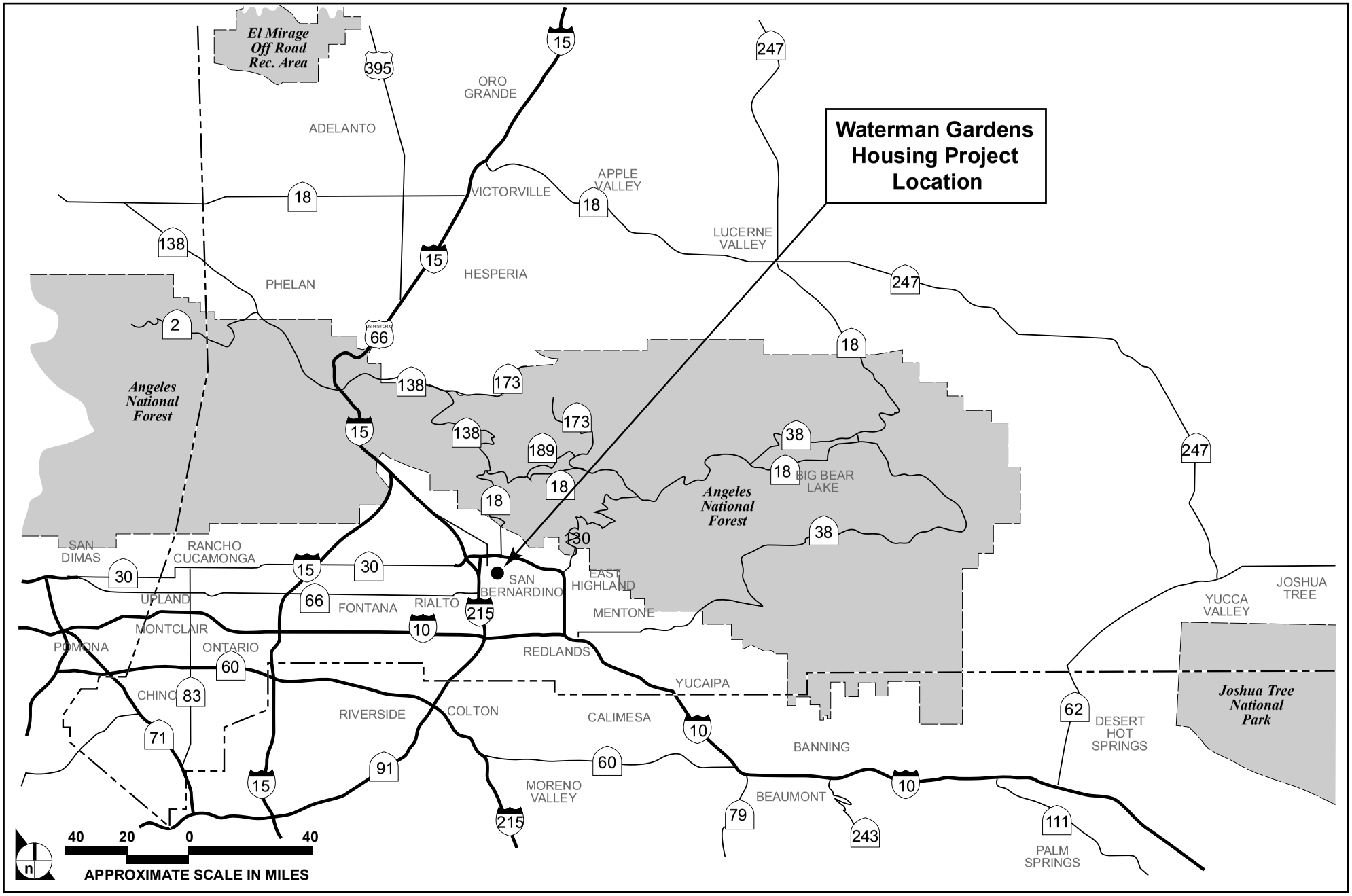
2 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006) 2-3.

3 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

4 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

5 U.S. Department of Transportation, Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 81.

6 California Department of Transportation, *Technical Noise Supplement; A Technical Supplement to the Traffic Noise Analysis Protocol*, (Sacramento, California: October 1998), pp. N51-N54.



SOURCE: Impact Sciences, Inc. – June 2011

FIGURE **1**

Project Site Location

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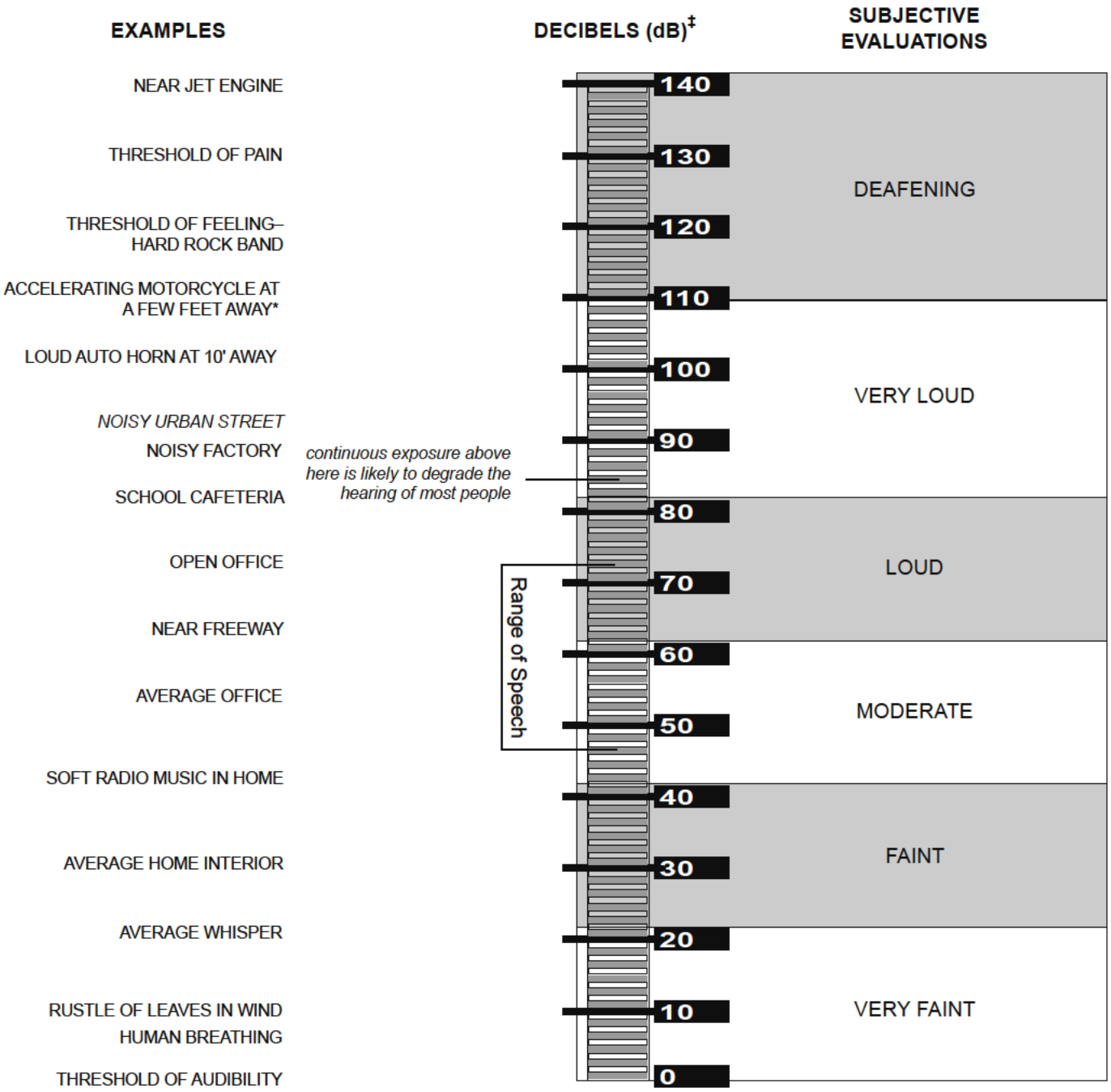

** NOTE: 50' from motorcycle equals noise at about 2000' from a four-engine jet aircraft.*

‡NOTE: dB are "average" values as measured on the A–scale of a sound–level meter.

SOURCE Egan, David M., Concepts in Architectural Acoustics, McGraw Hill, 1972; U.S. Department of Housing and Urban Development, Office of Community Planning and Development, The Noise Guidebook – 2002

FIGURE **2**

Common Noise Levels

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Below are brief definitions of these scales and other terminology commonly use in noise assessments:

- **Sound.** A vibratory disturbance created by a vibrating object which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- **A-Weighted Decibel (dB(A)).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Maximum Sound Level (Lmax).** The maximum sound level measured during the measurement period.
- **Minimum Sound Level (Lmin).** The minimum sound level measured during the measurement period.
- **Equivalent Sound Level (Leq).** The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
- **Day-Night Level (Ldn).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 PM to 7:00 AM
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 PM to 10:00 PM and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 PM to 7:00 AM

The Ldn and CNEL values differ by less than 1 dB. As discussed above, a 1 dB difference in noise level is not noticed by the human ear. Therefore, as a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment.

1.3 Vibration Fundamentals

Vibration consists of waves transmitted through solid material. Ground-borne vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hertz (Hz). Most environmental vibrations consist of a composite, or "spectrum," of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most ground-borne vibration that can be felt generally starts from a low

frequency of less than 1 Hz to a high of about 200 Hz. Vibration is often measured in terms of the peak particle velocity (PPV) in inches per second (in/sec), because it is related to the stresses that are experienced by buildings. Vibration is also measured in vibration decibels (VdB). The human threshold of perception is around 65 VdB; the dividing line between barely perceptible and distinctly perceptible is around 75 VdB; and vibration levels are acceptable at 85 VdB if there are an infrequent number of events per day.[7]

Vibration energy attenuates as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source.[8] High frequency vibrations reduce much more rapidly than low frequencies, so that in the far-field from a source, the low frequencies tend to dominate. Soil properties also affect the propagation of vibration. When ground-borne vibration interacts with a building, there is usually a ground-to-foundation coupling loss, but the vibration can also be amplified by the structural resonances of the walls and floors.[9] Vibration in buildings is typically perceived as rattling of windows or of items on shelves, or the motion of building surfaces.

Ground-borne vibration is generally limited to areas within a few hundred feet of certain types of construction activities, especially pile driving. Road vehicles rarely create enough ground-borne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps.[10] If traffic, typically heavy trucks, induces perceptible vibration in buildings, such as window rattling or shaking of small loose items, then it is most likely an effect of low-frequency airborne noise or ground characteristics. Human annoyance by vibration is related to the vibration energy and the number and duration of events, as well as the setting in which the person experiences the vibration. As discussed in the paragraph above, vibration can be amplified by the structural resonances of the walls and floors of buildings. The more events or the greater the duration, the more annoying it will be to humans.

2.0 ENVIRONMENTAL SETTING

2.1 Ambient Noise Levels

The project site is located at the intersection of Waterman Avenue and Base Line Street in the City of San Bernardino, California. The project area contains a variety of uses including residential, commercial,

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7 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006), 7-8.

8 California Department of Transportation, *Earthborne Vibrations*, (1990) VII-27.

9 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006), 7-1, 7-2.

10 U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, (2006), 7-9.

light-industrial and schools. Land uses immediately to the north and west include strip malls, restaurants, auto parts/body shops and other commercial and light industrial uses. Many of these uses front Base Line Street and Waterman Avenue. A commercial shopping center containing a grocery store is located directly north of the project site along Base Line Street. There are several isolated residential uses that also front Base Line Street and Waterman Avenue. Residential land uses are located from the project site further to the west and north beyond the commercial and light industrial uses along Base Line Street and Waterman Avenue. An agricultural and dairy operation is located to the east of the project site and an elementary school is located to the south along with a shopping center.

Noise generated by vehicular traffic traveling on the local roadway network represents the predominant and most consistent noise source in the project area. Vehicles traveling in the project area generally include automobiles, trucks, buses, and motorcycles. Noise levels were modeled with the analyzed using a computer-based sound model called SoundPlan. The SoundPlan noise modeling software provides a computer simulation of noise situations. SoundPlan is a three-dimensional noise propagation model that is used to visualize the effects of noise in the environment and is capable of modeling noise from a variety of sources including but not limited to stationary commercial and industrial equipment and motor vehicles. The model can account for source and receptor heights, terrain elevations, barriers, building and surface reflections, noise frequency, time histograms, and more. The model was setup to use the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) algorithms, which were used to calculate the Ldn noise levels based on traffic volumes, vehicle fleet mix, roadway traveling speeds, roadway geometry, elevation, and site conditions. Traffic volumes utilized as data inputs to the noise prediction model were based on information provided by Fehr & Peers, as part of the traffic study conducted for the project.[11] The primary roadways analyzed in the traffic study include the following:

- Baseline Street between E Street and Del Rosa Drive
- Waterman Avenue between Highland Avenue and 5th Street
- Crestview Avenue just north of Base Line Street
- La Junita Street between Base Line Street and Olive Street
- Olive Street at the intersection of Waterman Avenue

The traffic volumes for these studied roadways were then split into vehicle type (automobiles, medium trucks, heavy trucks, buses, motorcycles, and auxiliary vehicles) and traffic volumes by time of day (daytime, evening, nighttime) by using the EMFAC2007 model developed by the California Air Resources

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11 Fehr & Peers, *Draft Waterman Gardens Master Plan Traffic Impact Analysis*, (2011).

Board (CARB). While the EMFAC2007 model is primarily an air quality model, it can also be used to estimate hourly traffic volumes by vehicle type and by region. It is necessary to split the traffic volume by vehicle type because different vehicle generate different noise levels (e.g., trucks tend to generate higher noise levels compared to automobiles). The split by time of day is necessary in order to calculate CNEL or Ldn noise levels, which includes noise "penalties" for evening and nighttime noise levels, as explained in **Section 1.2, Noise Fundamentals**, above. For this project, the model was run for the non-desert portion of San Bernardino County within the South Coast Air Basin. Detailed calculations are provided in **Appendix A**. The model was also programmed with the locations of existing sensitive receptors along the modeled roadways, which primarily consist of residential and school land uses.

The results of the SoundPlan modeling analysis are provided in **Table 1, Summary of Existing Noise Levels Near the Project Site**. The modeling results are also presented graphically in **Figure 3, Existing Roadway Noise Levels**. The figure shows the area near to the project site, the noise sensitive receptors, and the noise contours. The shaded areas indicate the modeled noise levels in dB(A) Ldn, which is equivalent to dB(A) CNEL.

Table 1
Summary of Existing Noise Levels Near the Project Site

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))
28	Residential	Base Line	At La Junita	69.7
29	Residential	Base Line	East of La Junita	70.3
30	Residential	Base Line	East of La Junita	69.5
31	Residential	Base Line	East of La Junita	69.2
32	Residential	Base Line	East of La Junita	71.4
33	Residential	Base Line	East of La Junita	69.1
34	Residential	Base Line	East of La Junita	69.4
35	Residential	Base Line	East of La Junita	67.9
36	Residential	Base Line	East of La Junita	67.0
7	Residential	Base Line	West of Crestview	70.0
1	Residential	Base Line	West of Waterman	70.1
2	Residential	Base Line	West of Waterman	69.9
68	Residential	Base Line	West of Waterman	72.4
8	Residential	Crestview	North of Base Line	63.3
9	Residential	Crestview	North of Base Line	62.3
10	Residential	Crestview	North of Base Line	61.6
11	Residential	Crestview	North of Base Line	58.2
12	Residential	Crestview	North of Base Line	61.7

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))
13	Residential	Crestview	North of Base Line	61.7
14	Residential	Crestview	North of Base Line	61.5
15	Residential	Crestview	North of Base Line	61.4
16	Residential	Crestview	North of Base Line	61.1
17	Residential	Crestview	North of Base Line	61.4
18	Residential	Crestview	North of Base Line	61.4
19	Residential	Crestview	North of Base Line	60.5
20	Residential	Crestview	North of Base Line	61.1
21	Residential	Crestview	North of Base Line	60.8
22	School	Crestview	North of Base Line	58.6
23	School	Crestview	North of Base Line	59.0
24	School	Crestview	North of Base Line	59.3
25	School	Crestview	North of Base Line	59.5
26	School	Crestview	North of Base Line	59.9
27	School	Crestview	North of Base Line	60.7
43	Church	Olive	At La Junita	56.5
37	Residential	Olive	East of La Junita	52.7
38	Residential	Olive	East of La Junita	57.0
39	Residential	Olive	East of La Junita	57.3
40	Residential	Olive	East of La Junita	55.2
41	Residential	Olive	East of La Junita	55.2
42	Residential	Olive	East of La Junita	55.7
48	Residential	Olive	West of Waterman	61.5
49	Residential	Olive	West of Waterman	65.5
50	Residential	Olive	West of Waterman	60.9
51	Residential	Olive	West of Waterman	62.9
52	Residential	Olive	West of Waterman	59.5
53	Residential	Olive	West of Waterman	60.0
54	Residential	Olive	West of Waterman	58.0
55	Residential	Olive	West of Waterman	58.8
56	Residential	Olive	West of Waterman	56.7
57	Residential	Olive	West of Waterman	57.9
58	Residential	Olive	West of Waterman	56.1
59	Residential	Olive	West of Waterman	56.8
60	Residential	Olive	West of Waterman	55.6
61	Residential	Olive	West of Waterman	55.1
62	Residential	Olive	West of Waterman	58.1
64	Residential	Waterman	Between Base Line and Olive	65.8
3	Residential	Waterman	North of Base Line	61.8
5	Residential	Waterman	North of Base Line	56.1
6	Residential	Waterman	North of Base Line	53.7

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))
63	Residential	Waterman	North of Olive	65.1
65	Residential	Waterman	South of Base Line	63.1
66	Church	Waterman	South of Base Line	73.6
67	Residential	Waterman	South of Base Line	65.0
44	Residential	Waterman	South of Olive	64.9
45	Residential	Waterman	South of Olive	73.9
46	Residential	Waterman	South of Olive	65.0
47	Residential	Waterman	South of Olive	56.5

Source: Impact Sciences, Inc. Modeling results are provided in ***Appendix A****.*
Note: The effect of any existing noise barriers were not taken into account in the modeling analysis.

3.0 REGULATORY SETTING

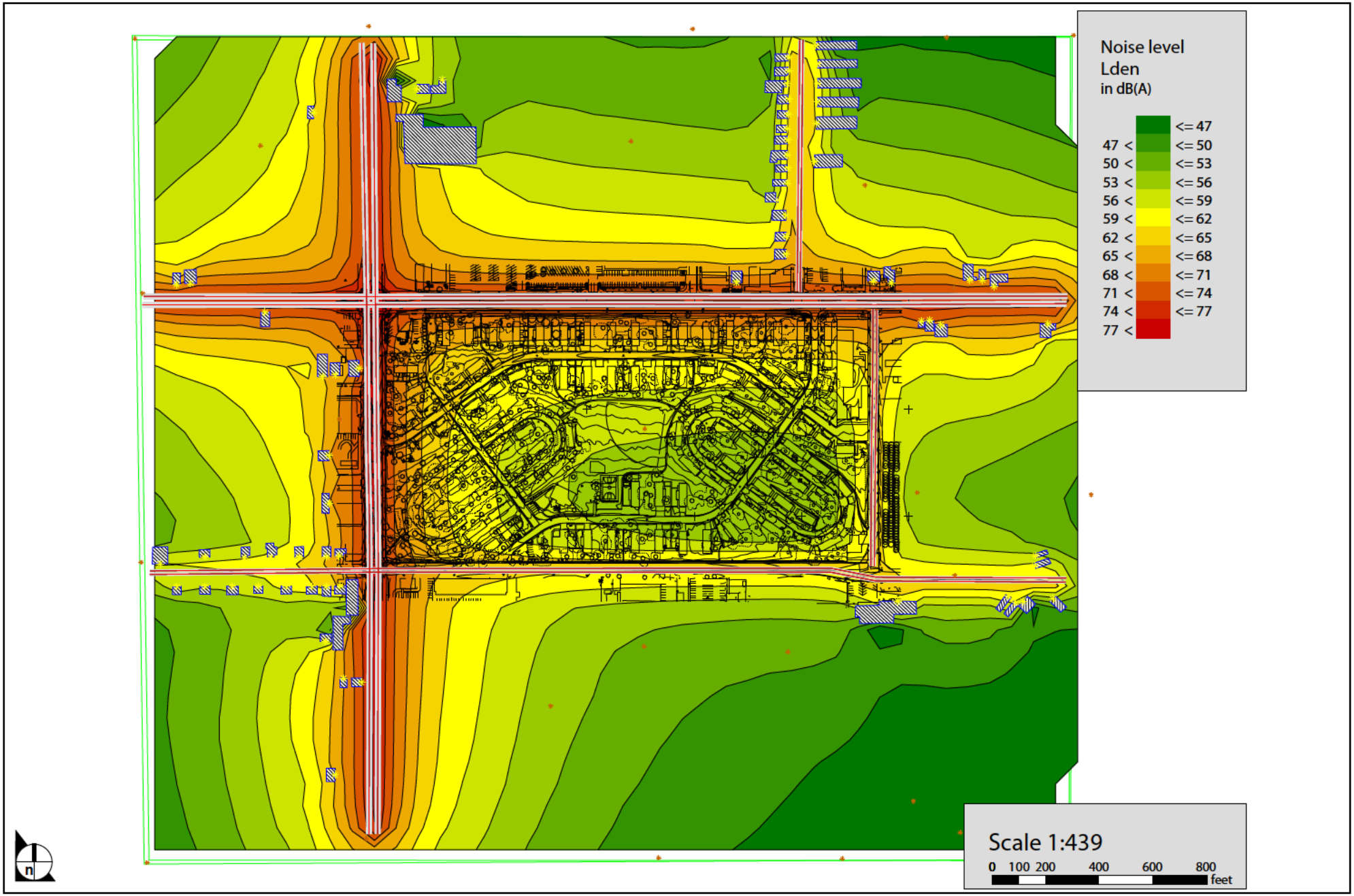
3.1 Federal

There are no federal noise requirements or regulations that bear directly on local actions of the City of San Bernardino. However, various federal agencies have provided guidance documents on assessing and mitigating noise impacts from construction and vehicle traffic. These guidance documents are discussed later under the project impacts section.

3.2 State

3.2.1 California Department of Health Services

The State of California Department of Health Services, Environmental Health Division, has published recommended guidelines for noise and land use compatibility, referred to as the *State Land Use Compatibility Guidelines for Noise* ("State Noise Guidelines"). The State Noise Guidelines, illustrated in **Figure 4, State Land Use Compatibility Guidelines for Noise**, indicate that residential land uses and other noise-sensitive receptors generally should locate in areas where outdoor ambient noise levels do not exceed 65 to 70 dB(A) (CNEL or L_{dn}). The Department of Health Services does not mandate application of this compatibility matrix to development projects; however, each jurisdiction is required to consider the State Noise Guidelines when developing its General Plan Noise Element or determining acceptable noise levels within its community.



SOURCE Impact Sciences, Inc. – 2011

FIGURE 3

Existing Roadway Noise Contours

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According to the State Noise Guidelines, an exterior noise level of 60 dB(A) CNEL is considered to be "normally acceptable" for single-family, duplex, and mobile homes involving normal, conventional construction, without any special noise insulation requirements. Exterior noise levels up to 65 dB(A) CNEL are typically considered "normally acceptable" for multi-family units and transient lodging without any special noise insulation requirements. Between these values and 70 dB(A) CNEL, exterior noise levels are typically considered "conditionally acceptable," and residential construction should only occur after a detailed analysis of the noise reduction requirements and needed noise attenuation features have been included in the project design. Exterior noise attenuation features include, but are not limited to, setbacks to place structures outside the conditionally acceptable noise contour, orienting structures so no windows open to the noise source, and/or installing noise barriers such as berms and/or solid walls. Within a 65 dB(A) CNEL exterior noise environment, interior noise levels will typically be reduced to acceptable levels (to at least 45 dB(A) CNEL) with closed windows through conventional construction, but include fresh air supply systems or air conditioning in order to maintain a comfortable living environment. The minimum attenuation of exterior to interior noise provided by typical structures in California is shown in **Table 2, Outside to Inside Noise Attenuation (dB(A))**.

Table 2
Outside to Inside Noise Attenuation (dB(A))

Building Type	Open Windows	Closed Windows[1]
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/Convalescent Homes	17	25
Offices	17	25
Theaters	20	30
Hotels/Motels	17	25

Source: Transportation Research Board, National Research Council, Highway Noise: A Design Guide for Highway Engineers, National Cooperative Highway Research Program Report 117.

[1] *As shown, structures with closed windows can attenuate exterior noise by a minimum of 25 to 30 dB(A).*

Under the State Noise Guidelines, an exterior noise level of 70.0 dB(A) CNEL is typically the dividing line between an acceptable and unacceptable exterior noise environment for all noise-sensitive uses, including schools, libraries, churches, hospitals, day care centers, and nursing homes of conventional construction. Noise levels below 75.0 dB(A) CNEL are typically acceptable for office and commercial buildings, while levels up to 75.0 dB(A) CNEL are typically acceptable for industrial uses.

3.2.2 California Noise Insulation Standards

The California Noise Insulation Standards (Cal. Code of Reg., Title 24, Sec. 3501 et seq.) require that interior noise levels from exterior sources be 45.0 dB(A) or less in any habitable room of a multi-residential use facility (e.g., hotels, motels, dormitories, long-term care facilities, and apartment houses and other dwellings, except detached single-family dwellings) with doors and windows closed. Measurements are based on CNEL or Ldn, whichever is consistent with the noise element of the local general plan. Where exterior noise levels exceed 60.0 dB(A) CNEL/Ldn, an acoustical analysis for new development is required to show that the proposed construction will reduce interior noise levels to 45.0 dB(A) CNEL/Ldn. If the interior 45.0 dB(A) CNEL/Ldn limit can be achieved only with the windows closed, the residence design must include mechanical ventilation that meets applicable Uniform Building Code (UBC) requirements.

3.2.3 California Department of Transportation (Caltrans)

The California Department of Transportation (Caltrans) provides noise standards for roadways in their jurisdiction including freeways. According to Caltrans typical freeway noises are 85.0 dB(A) and, therefore, noise levels at or below 85.0 dB(A) are considered normal freeway noise levels.[12]

3.2.4 California Division of Occupational Health and Safety

The California Division of Occupational Health and Safety provides guidelines to ensure people employed in the State of California are not exposed to noise levels greater than 85.0 dB(A). An employer would be required to administer a continuing effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85.0 dB(A) (referred to as the "action level"), or equivalently, a dose of 50 percent. The following procedures shall be implemented as part of the hearing conservation program when the action level is exceeded: personal or area noise monitoring, implementation of an audiometric testing program, an evaluation of an audiogram, audiometric test requirements, and audiometric calibration.[13] Furthermore, if the action level is exceeded, the employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85.0 dB(A), and shall ensure employee participation in the program. The training program shall be repeated annually for each employee included in the hearing

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12 California Department of Transportation, *Caltrans Safety Manual*, (1996) 13-5.

13 California Code of Regulations, Title 8, Section 5097, Hearing Conservation Program.

conservation program, and information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.[14]

3.3 Regional

3.3.1 City of San Bernardino Municipal Code

The City of San Bernardino Municipal Code specifies noise restrictions, exemptions, and variances for noise sources. Several of these are applicable to the proposed project. Section 8.54.020(L) of the Municipal Code prohibits the "operation or use between the hours of 10:00 p.m. and 8:00 a.m. of any pile driver, steam shovel, pneumatic hammers, derrick, steam or electric hoist, power driven saw, or any other tool or apparatus, the use of which is attended by loud and excessive noise, except with the approval of the City." Moreover, Section 8.54.070 specifically prohibits "any work of construction, erection, alteration, repair, addition, movement, demolition, or improvement to any building or structure except within the hours of 7:00 a.m. and 8:00 p.m." The Municipal Code also exempts certain activities associated with the proposed project. Section 8.54.020(H) states that noise resulting from "essential public services and facilities, including, but not limited to, trash collection and those of public utilities subject to the regulatory jurisdiction of the California Public Utilities Commission" are exempt from the provisions of Chapter 8.

The City's Noise Ordinance is codified in Chapter 19 of the Development Code. Section 19.20.030.15 specifies maximum acceptable levels of noise for residential uses in the City. The standard indicates that exterior noise levels at residential locations should not exceed a CNEL of 65 dB while interior levels should not exceed an annual CNEL of 45 dB in any habitable room.

The City's Vibration Ordinance is also codified in Chapter 19 of the Development Code. Section 19.20.030.28 states that "no vibration associated with any use shall be permitted which is discernible beyond the boundary line of the property."

3.3.2 City of San Bernardino General Plan

Local governments have the authority and responsibility to regulate sources of noise through their police power and land use decision-making authority. In general, a first step toward implementation of a local government's responsibility is accomplished by identifying air quality goals, policies and implementation measures in its General Plan, such as the Noise section in the City of San Bernardino General Plan. In accordance with the CEQA requirements and the CEQA review process, local governments assess noise

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14 California Code of Regulations, Title 8, Section 5099, Training Program.

impacts, require mitigation of potentially significant noise impacts by conditioning discretionary permits, and monitor and enforce implementation of such mitigation. Development in the proposed project is subject to the City's General Plan. The City of San Bernardino General Plan identifies goals and policies that guide development within the City. Specific policies of the General Plan that are particularly relevant to noise control are listed in Chapter 14, Noise. The following policies are relevant to the proposed project:

Goal 6.5 Develop a transportation system that reduced conflicts between commercial trucking, private/public transportation, and land uses.

- Policy 6.5.1 Provide designated truck routes for use by commercial/industrial trucking that minimize impacts on local traffic and neighborhoods.

Goal 14.1 Ensure that residents are protected from excessive noise through careful land planning.

- Policy 14.1.1 Minimize, reduce, or prohibit, as may be required, the new development of housing, health care facilities, schools, libraries, religious facilities, and other noise sensitive uses in areas where existing or future noise levels exceed an Ldn of 65 dB(A) exterior and an Ldn of 45 dB(A) interior if the noise cannot be reduced to these levels. (LU-1)
- Policy 14.1.2 Require that automobile and truck access to commercial properties abutting residential parcels be located at the maximum practical distance from the residential parcel. (LU-1)

Goal 14.2 Encourage the reduction of noise from transportation-related noise sources such as motor vehicles, aircraft operations, and railroad movements.

- Policy 14.2.2 Employ noise mitigation practices when designing future streets and highways, and when improvements occur along existing road segments. Mitigation measures should emphasize the establishment of natural buffers or setbacks between the arterial roadways and adjoining noise-sensitive areas. (N-1)
- Policy 14.2.3 Require that development that increases the ambient noise level adjacent to noise-sensitive land uses provide appropriate mitigation measures. (LU-1)
- Policy 14.2.6 Buffer residential neighborhoods from noise caused by train operations and increasing high traffic volumes along major arterials and freeways. (N-1)
- Policy 14.2.10 Provide for the development of alternate transportation modes such as bicycle paths and pedestrian walkways to minimize the number of automobile trips. (LU-1)

Policy 14.2.13	Work with local agencies and businesses to provide public transit services that reduce traffic and associated noise.
Policy 14.2.19	As may be necessary, require acoustical analysis and ensure the provision of effective noise mitigation measures for sensitive land uses, especially residential uses, in areas significantly impacted by noise.

Goal 14.3 Protect residents from the negative effects of "spill over" or nuisance noise.

Policy 14.3.1	Require that construction activities adjacent to residential units be limited as necessary to prevent adverse noise impacts. (LU-1)
Policy 14.3.2	Require that construction activities employ feasible and practical techniques that minimize the noise impacts on adjacent uses. (LU-1)
Policy 14.3.3	Adopt and enforce a standard for exterior noise levels for all commercial uses that prevents adverse levels of discernible noise on adjoining residential properties. (A-1)
Policy 14.3.5	Require that the hours of truck deliveries to commercial properties abutting residential uses be limited unless there is no feasible alternative or there are overriding transportation benefits by scheduling deliveries at another hour. (LU-1)
Policy 14.3.6	Ensure that buildings are constructed soundly to prevent adverse noise transmission between differing uses located in the same structure and individual residences in multifamily buildings. (LU-1)

4.0 METHODOLOGY

Construction of the project would require demolition, grading, building construction, asphalt paving, and architectural coating. These activities typically involve the use of heavy equipment, such as tractors, dozers, and cranes. While construction would be temporary, the use of these types of equipment would generate both steady state and episodic noise that would be heard both on and off the project site. Once the project becomes operational, the permanently installed equipment and project motor vehicles would generate long-term noise. The level of operational noise would depend on the equipment design specifications and any noise reduction or shielding features.

The construction noise impacts were estimated using data from the Federal Transit Administration (FTA). The FTA has compiled data on the noise-generating characteristics of specific types of construction equipment.[15] Noise levels generated by heavy equipment can range from approximately 70 dB(A) to

[15] U.S. Department of Transportation, Federal Highway Administration, Roadway Noise Construction Model (RCNM), Software Version 1.1 (12/08/2008).

noise levels in excess of 100 dB(A) when measured at a distance of 50 feet from the noise source. The noise levels diminish rapidly with distance at a rate of approximately 6.0 to 7.5 dB(A) per doubling of distance for acoustically hard and soft sites, respectively. An example of an acoustically hard site would be a parking lot while an acoustically soft site would be a park. Assuming an acoustically hard site, a noise level of 75 dB(A) measured at 50 feet from the noise source would be reduced to 69 dB(A) at 100 feet and to 63 dB(A) at 200 feet. Construction noise levels at sensitive receptors would tend to vary based on the location of construction activity and the number of equipment in operation. The project would be constructed in phases with demolition from the next phase overlapping with the final months of building construction from the previous phase. However, these overlapping activities would not occur at the same location and thus would not have a combined impact on sensitive receptors. This analysis modeled the maximum construction noise impacts under several worst-case scenarios, each scenario representing a combination of equipment types and locations. Construction will not take place during the evening and nighttime hours, in accordance with the City of San Bernardino Municipal Code.

The operational noise impacts would primarily result from the incremental increase in motor vehicles traveling on roadways. To a lesser extent, noise may also be generated from trash trucks servicing the project site and from stationary roof-top heating, ventilation, and air conditioning (HVAC) equipment, although the latter would be a relatively minor contributor to noise levels. The operational noise impacts were analyzed using a computer-based sound model called SoundPLAN. The SoundPLAN noise modeling software provides a computer simulation of noise situations. SoundPLAN is a three-dimensional noise propagation model that is used to visualize the effects of noise in the environment and is capable of modeling noise from a variety of sources including but not limited to stationary commercial and industrial equipment and motor vehicles. The model can account for source and receptor heights, terrain elevations, barriers, building and surface reflections, noise frequency, time histograms, and more.

5.0 THRESHOLDS OF SIGNIFICANCE

According to Appendix G of the *State CEQA Guidelines*, the proposed project would have a significant impact related to noise if it would:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive ground borne vibration or ground borne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Appendix G contains additional criteria for projects located within in airport land use plan or located within 2 miles of a public or public-use airport. Because the project is not located within an airport land use plan or within 2 miles of a public or public-use airport, the following two criteria do not apply to the proposed project.

- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels. **(NO IMPACT)**

- For a project within the vicinity of a private airstrip, would expose people residing or working in the project area to excessive noise levels. **(NO IMPACT)**

Construction noise is governed by Municipal Code Section 8.54.070, which prohibits "any work of construction, erection, alteration, repair, addition, movement, demolition, or improvement to any building or structure except within the hours of 7:00 a.m. and 8:00 p.m." Construction noise is also governed by policies in the General Plan.

Operational noise is governed by the City's Noise Ordinance (Section 19.20.030.15 of the Development Code), which indicates that exterior noise levels at residential locations should not exceed a CNEL of 65 dB(A). For purposes of evaluating the significance of the noise impacts, the following numeric thresholds were used:

- An increase of 3.0 dB(A) or more, which causes the significance threshold of 65 dB(A) CNEL for sensitive land uses to be exceeded; or

- An increase of 5.0 dB(A) or more.

The increase in noise is based on comparing the project and no build conditions within the same time frame. A noise increase of 3.0 dB(A) is considered to be a perceptible increase in noise levels. An increase of 5.0 dB(A) is used to evaluate noise impacts in areas where the ambient or background noise levels without the project are low or moderate. The use of this "sliding scale" is appropriate because where ambient/background levels are low, an increase of 3.0 dB(A) may be perceptible but would not be enough to create an annoyance or nuisance. On the other hand, where the ambient/background noise levels are already moderately high, an increase of 3.0 dB(A) would exacerbate an existing noise problem and would potentially increase the level of annoyance perceived by sensitive receptors.

The project would not include any stationary sources of vibrations during operation. Construction equipment may produce temporary and infrequent ground-borne vibration. For purposes of evaluating the significance of the vibration impacts, the following numeric thresholds were used:

- Vibration levels that exceed approximately 85 VdB at sensitive land uses, which is the vibration level that is considered by the FTA to be the threshold for human annoyance for infrequent ground-borne vibration; or
- Vibration levels that exceed approximately 100 VdB for fragile buildings and approximately 95 VdB for extremely fragile historic buildings.

6.0 IMPACT ANALYSIS

Threshold: Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Construction Noise

The FTA has compiled data on the noise-generating characteristics of specific types of construction equipment.[16] Noise levels generated by heavy equipment can range from approximately 75 dB(A) to noise levels in excess of 100 dB(A) when measured at a distance of 50 feet from the noise source. The noise levels diminish rapidly with distance at a rate of approximately 6.0 to 7.5 dB(A) per doubling of distance for acoustically hard and soft sites, respectively.

The types of construction equipment used would vary depending on the construction activity taking place. Demolition would use equipment such as saws, dozers, excavators, and backhoes. Grading would use equipment such as dozers, excavators, graders, and backhoes. Building construction would use equipment such as forklifts, cranes, generators, air compressors, and welders. Surface paving would use rollers and paving equipment.

The noise levels associated with construction of the proposed project are provided below in **Table 3, Estimated Unmitigated Construction Noise Levels**. The Lmax and Leq noise levels for the loudest equipment is shown in the table below. The Lmax noise level represents the highest instantaneous noise levels that would be expected and the Leq noise level takes into account estimate usage factors, or load factors, for the equipment. The load factors are an estimated percentage of time that the equipment would actually be in use. In order to provide a conservative analysis, the noise levels were estimated at the closest point to noise sensitive receptors. The closest point at which heavy-duty construction equipment would operate from noise sensitive receptors would be approximately 100 feet while hand equipment, such as saws and welders, would be approximately 150 feet.

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16 U.S. Department of Transportation, Federal Highway Administration, Roadway Noise Construction Model (RCNM), Software Version 1.1 (12/08/2008).

Table 3
Estimated Unmitigated Construction Noise Levels

Construction Activity	Noise Levels	
	Lmax (dB(A))	Leq (dB(A))
Demolition	80.5	75.0
Grading	79.0	75.0
Building Construction	79.0	76.0

Source: Impact Sciences, Inc. Noise calculations are provided in ***Appendix B****.*

Mitigation of construction noise impacts to a level that is less than significant would be conducted through the enforcement of the San Bernardino Municipal Code and in a broader sense through the policies of the General Plan Noise Element.

Operational Noise

The proposed project would develop approximately 500 residential units, a 45,835 square foot recreational facility, a 58,200 square foot community support center, a 4,000 square foot community care facility, a 6,000 square foot Administration and Community room, a 7,000 square foot recycling facility, and a 20,000 square foot shop and youth/jobs training facility. As such, the project would result in an incremental increase in area traffic volumes above those that would occur without the project. Noise generated by vehicular traffic traveling on the local roadway network represents the predominant and most consistent noise source for the project. Vehicles traveling in the project area generally include automobiles, trucks, buses, and motorcycles. The project would require the use of heavy trucks for refuse and municipal solid waste collection. The project would also include rooftop condensers for residential heating ventilation and cooling systems (HVAC); however, the noise from these would be drowned out by traffic and truck noise.

As described above, noise levels were modeled with the analyzed using the SoundPlan. The model was setup to use the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) algorithms, which were used to calculate the Ldn noise levels based on traffic volumes, vehicle fleet mix, roadway traveling speeds, roadway geometry, elevation, and site conditions. Traffic volumes utilized as data inputs to the noise prediction model were based on information provided by Fehr & Peers, as part of the

traffic study conducted for the project.[17] The operational noise impacts were analyzed under four scenarios traffic scenarios:

- Future Opening Year (2013) Traffic Volumes without the Project
- Future Opening Year (2013) Traffic Volumes plus the Project
- Future Buildout Year (2030) Traffic Volumes without the Project
- Future Buildout Year (2030) Traffic Volumes plus the Project

As was done for the noise analysis for the existing noise environment, the traffic volumes were split into vehicle type (automobiles, medium trucks, heavy trucks, buses, motorcycles, and auxiliary vehicles) and traffic volumes by time of day (daytime, evening, nighttime) using the EMFAC2007 model. It is necessary to split the traffic volume by vehicle type because different vehicle generate different noise levels (e.g., trucks tend to generate higher noise levels compared to automobiles). The split by time of day is necessary in order to calculate CNEL or Ldn noise levels, which includes noise "penalties" for evening and nighttime noise levels, as explained in **Section 1.2, Noise Fundamentals**, above. Detailed calculations are provided in **Appendix A**. The model was also programmed with the locations of existing sensitive receptors along the modeled roadways, which primarily consist of residential and school land uses.

The results of the SoundPlan modeling analysis for the opening year scenarios are provided in **Table 4, Summary of Future Opening Year (2013) Noise Levels Near the Project Site**. The modeling results are also presented graphically in **Figure 5, Future (2013) Roadway Noise Contours – Without Project** and in **Figure 6, Future (2013) Roadway Noise Contours – With Project**. The figure shows the area near to the project site, the noise sensitive receptors, and the noise contours. The shaded areas indicate the modeled noise levels in dB(A) Ldn, which is equivalent to dB(A) CNEL. As shown in **Table 4**, the increase in noise levels is much less than 3 dB(A). As a result, the increase in noise levels from future 2013 traffic volume growth and the incremental increase in project related noise would not be perceptible and would result in a less than significant impact.

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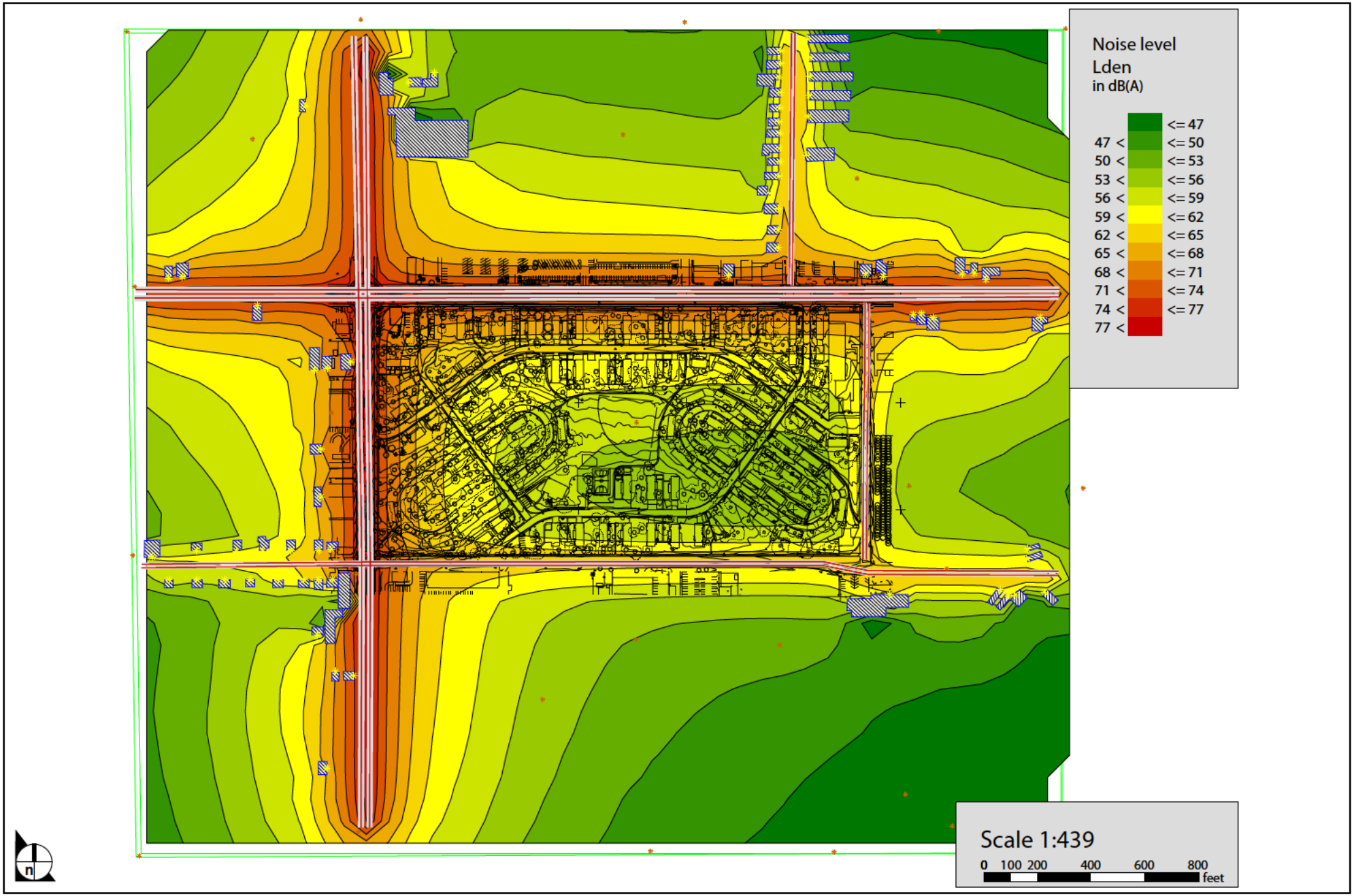
17 Fehr & Peers, *Draft Waterman Gardens Master Plan Traffic Impact Analysis*, (2011).

Table 4
Summary of Future Opening Year (2013) Noise Levels Near the Project Site

				Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
Model ID	Receptor Type	Roadway	Road Segment	Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
28	Residential	Base Line	At La Junita	69.7	69.9	0.2	70.1	0.4
29	Residential	Base Line	East of La Junita	70.3	70.5	0.2	70.6	0.3
30	Residential	Base Line	East of La Junita	69.5	69.7	0.2	69.8	0.3
31	Residential	Base Line	East of La Junita	69.2	69.5	0.3	69.6	0.4
32	Residential	Base Line	East of La Junita	71.4	71.7	0.3	71.8	0.4
33	Residential	Base Line	East of La Junita	69.1	69.4	0.3	69.5	0.4
34	Residential	Base Line	East of La Junita	69.4	69.6	0.2	69.7	0.3
35	Residential	Base Line	East of La Junita	67.9	68.1	0.2	68.2	0.3
36	Residential	Base Line	East of La Junita	67.0	67.2	0.2	67.3	0.3
7	Residential	Base Line	West of Crestview	70.0	70.3	0.3	70.7	0.7
1	Residential	Base Line	West of Waterman	70.1	70.4	0.3	70.7	0.6
2	Residential	Base Line	West of Waterman	69.9	70.2	0.3	70.5	0.6
68	Residential	Base Line	West of Waterman	72.4	72.7	0.3	73.0	0.6
8	Residential	Crestview	North of Base Line	63.3	63.5	0.2	63.8	0.5
9	Residential	Crestview	North of Base Line	62.3	62.5	0.2	62.8	0.5
10	Residential	Crestview	North of Base Line	61.6	61.8	0.2	62.0	0.4
11	Residential	Crestview	North of Base Line	58.2	58.4	0.2	58.4	0.2
12	Residential	Crestview	North of Base Line	61.7	61.9	0.2	62.0	0.3
13	Residential	Crestview	North of Base Line	61.7	61.8	0.1	61.9	0.2
14	Residential	Crestview	North of Base Line	61.5	61.6	0.1	61.7	0.2
15	Residential	Crestview	North of Base Line	61.4	61.5	0.1	61.6	0.2
16	Residential	Crestview	North of Base Line	61.1	61.2	0.1	61.3	0.2
17	Residential	Crestview	North of Base Line	61.4	61.5	0.1	61.6	0.2

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
				Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
18	Residential	Crestview	North of Base Line	61.4	61.5	0.1	61.6	0.2
19	Residential	Crestview	North of Base Line	60.5	60.7	0.2	60.7	0.2
20	Residential	Crestview	North of Base Line	61.1	61.2	0.1	61.3	0.2
21	Residential	Crestview	North of Base Line	60.8	61.0	0.2	61.0	0.2
22	School	Crestview	North of Base Line	58.6	58.7	0.1	58.7	0.1
23	School	Crestview	North of Base Line	59.0	59.1	0.1	59.1	0.1
24	School	Crestview	North of Base Line	59.3	59.4	0.1	59.4	0.1
25	School	Crestview	North of Base Line	59.5	59.6	0.1	59.6	0.1
26	School	Crestview	North of Base Line	59.9	60.0	0.1	60.1	0.2
27	School	Crestview	North of Base Line	60.7	60.8	0.1	61.0	0.3
43	Church	Olive	At La Junita	56.5	57.2	0.7	57.9	1.4
37	Residential	Olive	East of La Junita	52.7	53.4	0.7	53.6	0.9
38	Residential	Olive	East of La Junita	57.0	57.7	0.7	58.4	1.4
39	Residential	Olive	East of La Junita	57.3	58.2	0.9	58.7	1.4
40	Residential	Olive	East of La Junita	55.2	56.0	0.8	56.5	1.3
41	Residential	Olive	East of La Junita	55.2	56.0	0.8	56.5	1.3
42	Residential	Olive	East of La Junita	55.7	56.6	0.9	57.1	1.4
48	Residential	Olive	West of Waterman	61.5	61.7	0.2	61.8	0.3
49	Residential	Olive	West of Waterman	65.5	65.7	0.2	65.8	0.3
50	Residential	Olive	West of Waterman	60.9	61.1	0.2	61.1	0.2
51	Residential	Olive	West of Waterman	62.9	63.2	0.3	63.2	0.3
52	Residential	Olive	West of Waterman	59.5	59.7	0.2	59.8	0.3
53	Residential	Olive	West of Waterman	60.0	60.2	0.2	60.2	0.2
54	Residential	Olive	West of Waterman	58.0	58.3	0.3	58.3	0.3
55	Residential	Olive	West of Waterman	58.8	59.0	0.2	58.9	0.1
56	Residential	Olive	West of Waterman	56.7	57.0	0.3	56.9	0.2
57	Residential	Olive	West of Waterman	57.9	58.1	0.2	58.1	0.2

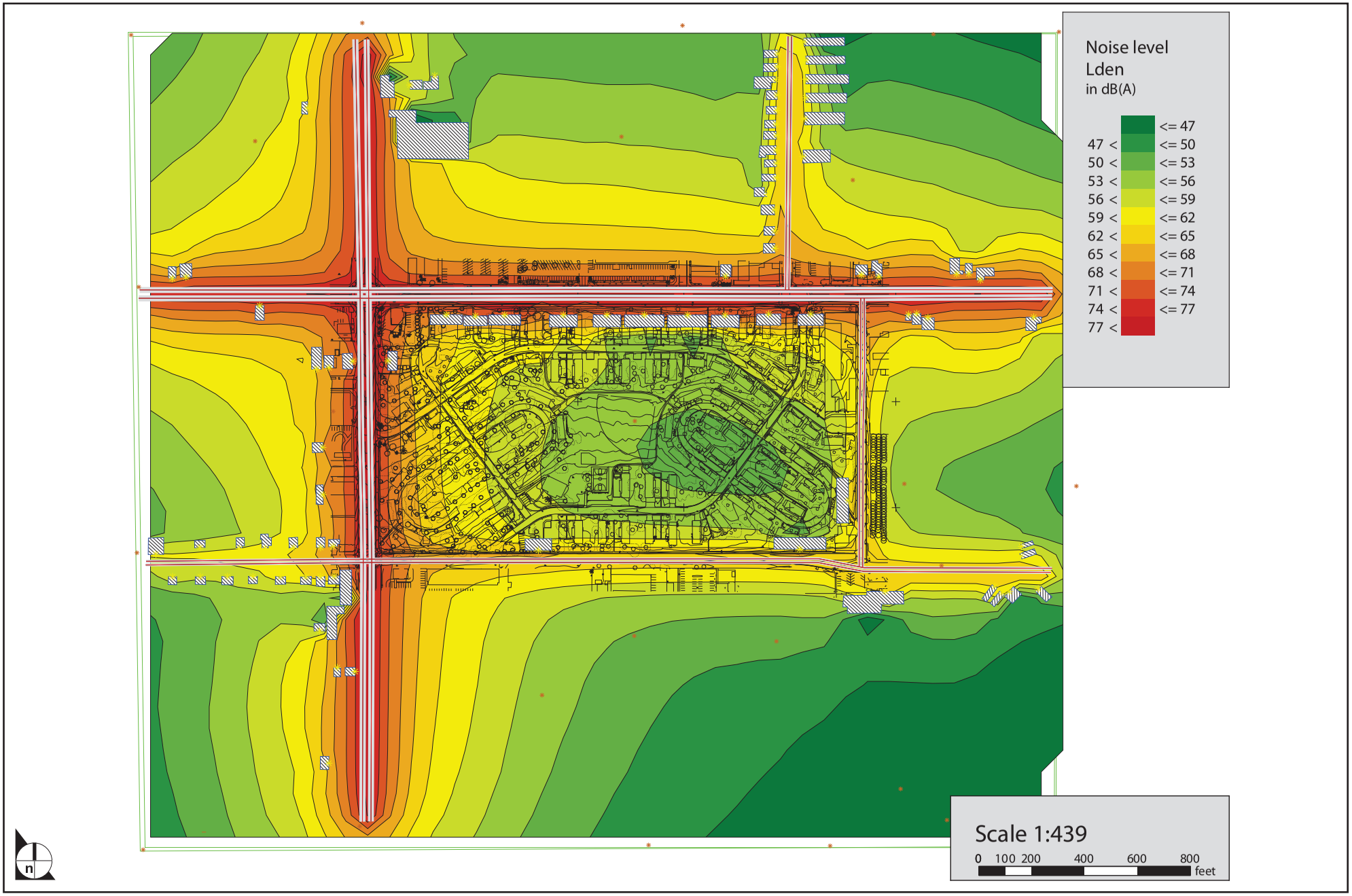


SOURCE Impact Sciences, Inc. – 2011

FIGURE 5

Future (2013) Roadway Noise Contours - Without Project

1085.001•06/11



SOURCE: Impact Sciences, Inc. – 2011

FIGURE **6**

Future (2013) Roadway Noise Contours - With Project

1085-001•07/11

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
				Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
58	Residential	Olive	West of Waterman	56.1	56.3	0.2	56.3	0.2
59	Residential	Olive	West of Waterman	56.8	57.0	0.2	57.0	0.2
60	Residential	Olive	West of Waterman	55.6	55.8	0.2	55.7	0.1
61	Residential	Olive	West of Waterman	55.1	55.4	0.3	55.4	0.3
62	Residential	Olive	West of Waterman	58.1	58.2	0.1	58.2	0.1
64	Residential	Waterman	Between Base Line & Olive	65.8	66.0	0.2	66.2	0.4
3	Residential	Waterman	North of Base Line	61.8	62.1	0.3	62.2	0.4
5	Residential	Waterman	North of Base Line	56.1	56.3	0.2	56.5	0.4
6	Residential	Waterman	North of Base Line	53.7	54.0	0.3	54.1	0.4
63	Residential	Waterman	North of Olive	65.1	65.4	0.3	65.5	0.4
65	Residential	Waterman	South of Base Line	63.1	63.4	0.3	63.6	0.5
66	Church	Waterman	South of Base Line	73.6	73.9	0.3	74.0	0.4
67	Residential	Waterman	South of Base Line	65.0	65.2	0.2	65.4	0.4
44	Residential	Waterman	South of Olive	64.9	65.2	0.3	65.3	0.4
45	Residential	Waterman	South of Olive	73.9	74.1	0.2	74.3	0.4
46	Residential	Waterman	South of Olive	65.0	65.2	0.2	65.4	0.4
47	Residential	Waterman	South of Olive	56.5	56.7	0.2	56.8	0.3

Source: Impact Sciences, Inc. Modeling results are provided in ***Appendix A****.*
Note: The effect of any existing noise barriers were not taken into account in the modeling analysis.

The results of the SoundPlan modeling analysis for the future buildout year scenarios are provided in **Table 5, Summary of Future Buildout Year (2030) Noise Levels Near the Project Site**. The modeling results are also presented graphically in **Figure 7, Cumulative Future (2030) Roadway Noise Contours – Without Project** and in **Figure 8, Cumulative Future (2030) Roadway Noise Contours – With Project**. The figure shows the area near to the project site, the noise sensitive receptors, and the noise contours. The shaded areas indicate the modeled noise levels in dB(A) Ldn, which is equivalent to dB(A) CNEL. As shown in **Table 5**, the increase in noise levels is less than 3 dB(A), except for noise levels along Olive Street under Future Buildout Year (2030) Plus Project conditions. Noise sensitive receptors along Olive street may experience perceptible increases in noise of 3 dB(A) or more. However, the Ldn noise levels at these receptors are all under 65 dB(A), which is the threshold for noise sensitive uses in the City of San Bernardino. As a result, this would not be considered a significant impact and the increase in noise levels from future buildout 2030 traffic volume growth and the incremental increase in project related noise would result in a less than significant impact.

Since the project would locate residential land uses on-site, the project itself could expose future project residents to noise levels that exceed the City of San Bernardino noise threshold of 65 dB(A) for noise sensitive uses. Noise modeling was also performed for selected on-site noise receptors that would be adjacent to the surrounding roadways, and thus be subjected to the highest levels of noise. The results of the SoundPlan modeling analysis for the future on-site residents under opening year (2013) and buildout year (2030) scenarios are provided in **Table 6, Summary of Future 2013 and 2030 Noise Levels for Select On-Site Project Residents**. As shown in **Table 6**, on-site residents could be expose to noise levels above 65 dB(A) along Waterman Avenue and Base Line Street. This is considered a potentially significant impact requiring mitigation.

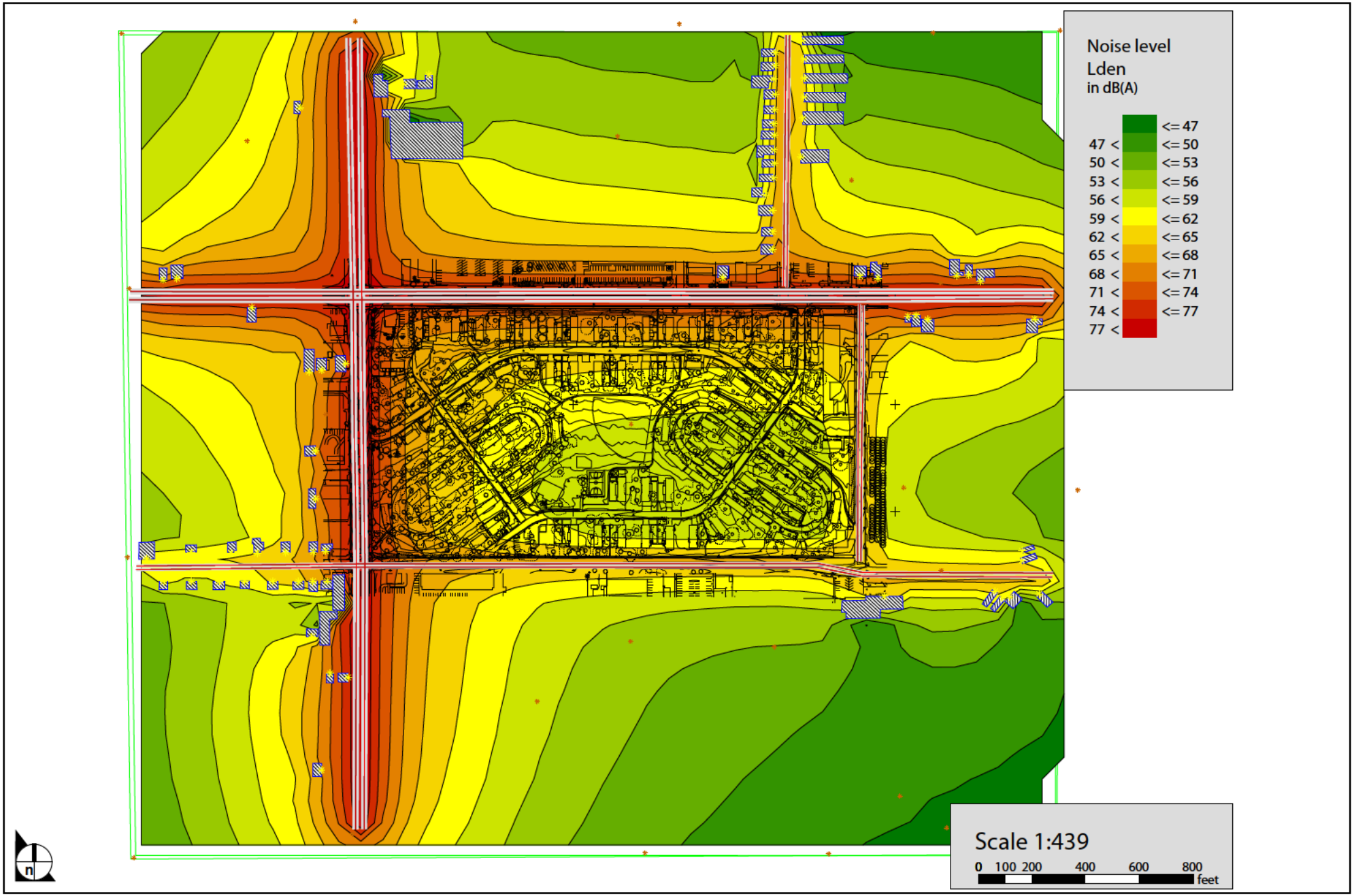
Table 5
Summary of Future Buildout Year (2030) Noise Levels Near the Project Site

				Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
Model ID	Receptor Type	Roadway	Road Segment	Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
28	Residential	Base Line	At La Junita	69.7	71.5	1.8	72.3	2.6
29	Residential	Base Line	East of La Junita	70.3	72.1	1.8	72.9	2.6
30	Residential	Base Line	East of La Junita	69.5	71.2	1.7	72.1	2.6
31	Residential	Base Line	East of La Junita	69.2	71.0	1.8	71.8	2.6
32	Residential	Base Line	East of La Junita	71.4	73.3	1.9	74.0	2.6
33	Residential	Base Line	East of La Junita	69.1	70.5	1.4	71.7	2.6
34	Residential	Base Line	East of La Junita	69.4	70.7	1.3	72.0	2.6
35	Residential	Base Line	East of La Junita	67.9	69.1	1.2	70.4	2.5
36	Residential	Base Line	East of La Junita	67.0	68.2	1.2	69.5	2.5
7	Residential	Base Line	West of Crestview	70.0	71.9	1.9	72.9	2.9
1	Residential	Base Line	West of Waterman	70.1	72.0	1.9	72.8	2.7
2	Residential	Base Line	West of Waterman	69.9	71.8	1.9	72.6	2.7
68	Residential	Base Line	West of Waterman	72.4	73.5	1.1	75.1	2.7
8	Residential	Crestview	North of Base Line	63.3	65.2	1.9	66.0	2.7
9	Residential	Crestview	North of Base Line	62.3	64.3	2.0	65.0	2.7
10	Residential	Crestview	North of Base Line	61.6	63.6	2.0	64.1	2.5
11	Residential	Crestview	North of Base Line	58.2	60.2	2.0	60.4	2.2
12	Residential	Crestview	North of Base Line	61.7	63.8	2.1	64.1	2.4
13	Residential	Crestview	North of Base Line	61.7	63.8	2.1	64.0	2.3
14	Residential	Crestview	North of Base Line	61.5	63.6	2.1	63.8	2.3
15	Residential	Crestview	North of Base Line	61.4	63.5	2.1	63.7	2.3
16	Residential	Crestview	North of Base Line	61.1	63.2	2.1	63.3	2.2
17	Residential	Crestview	North of Base Line	61.4	63.5	2.1	63.6	2.2

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
				Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
18	Residential	Crestview	North of Base Line	61.4	63.6	2.2	63.6	2.2
19	Residential	Crestview	North of Base Line	60.5	62.7	2.2	62.7	2.2
20	Residential	Crestview	North of Base Line	61.1	63.3	2.2	63.3	2.2
21	Residential	Crestview	North of Base Line	60.8	63.0	2.2	63.0	2.2
22	School	Crestview	North of Base Line	58.6	60.7	2.1	60.8	2.2
23	School	Crestview	North of Base Line	59.0	61.1	2.1	61.1	2.1
24	School	Crestview	North of Base Line	59.3	61.4	2.1	61.4	2.1
25	School	Crestview	North of Base Line	59.5	61.6	2.1	61.6	2.1
26	School	Crestview	North of Base Line	59.9	62.0	2.1	62.0	2.1
27	School	Crestview	North of Base Line	60.7	62.8	2.1	62.9	2.2
43	Church	Olive	At La Junita	56.5	58.5	2.0	59.8	**3.3**
37	Residential	Olive	East of La Junita	52.7	54.9	2.2	55.5	2.8
38	Residential	Olive	East of La Junita	57.0	59.4	2.4	60.3	**3.3**
39	Residential	Olive	East of La Junita	57.3	59.3	2.0	60.6	**3.3**
40	Residential	Olive	East of La Junita	55.2	57.3	2.1	58.4	**3.2**
41	Residential	Olive	East of La Junita	55.2	57.3	2.1	58.4	**3.2**
42	Residential	Olive	East of La Junita	55.7	57.7	2.0	59.0	**3.3**
48	Residential	Olive	West of Waterman	61.5	63.9	2.4	64.3	2.8
49	Residential	Olive	West of Waterman	65.5	68.0	2.5	68.2	2.7
50	Residential	Olive	West of Waterman	60.9	63.3	2.4	63.7	2.8
51	Residential	Olive	West of Waterman	62.9	65.4	2.5	65.6	2.7
52	Residential	Olive	West of Waterman	59.5	61.9	2.4	62.4	2.9
53	Residential	Olive	West of Waterman	60.0	62.3	2.3	62.7	2.7
54	Residential	Olive	West of Waterman	58.0	60.3	2.3	61.0	**3.0**
55	Residential	Olive	West of Waterman	58.8	61.0	2.2	61.5	2.7
56	Residential	Olive	West of Waterman	56.7	58.8	2.1	59.8	**3.1**
57	Residential	Olive	West of Waterman	57.9	60.0	2.1	60.7	2.8

Model ID	Receptor Type	Roadway	Road Segment	Maximum Estimated Noise Level Ldn (dB(A))				
					Future Without Project		Future Plus Project	
				Existing	Estimated Noise Level	Change from Existing	Estimated Noise Level	Change from Existing
58	Residential	Olive	West of Waterman	56.1	58.1	2.0	59.3	**3.2**
59	Residential	Olive	West of Waterman	56.8	58.9	2.1	59.6	2.8
60	Residential	Olive	West of Waterman	55.6	57.5	1.9	58.8	**3.2**
61	Residential	Olive	West of Waterman	55.1	57.0	1.9	58.6	**3.5**
62	Residential	Olive	West of Waterman	58.1	60.1	2.0	60.9	2.8
64	Residential	Waterman	Between Base Line & Olive	65.8	68.4	2.6	68.5	2.7
3	Residential	Waterman	North of Base Line	61.8	64.4	2.6	64.5	2.7
5	Residential	Waterman	North of Base Line	56.1	58.7	2.6	58.8	2.7
6	Residential	Waterman	North of Base Line	53.7	56.3	2.6	56.4	2.7
63	Residential	Waterman	North of Olive	65.1	67.7	2.6	67.8	2.7
65	Residential	Waterman	South of Base Line	63.1	65.6	2.5	65.9	2.8
66	Church	Waterman	South of Base Line	73.6	76.2	2.6	76.4	2.8
67	Residential	Waterman	South of Base Line	65.0	67.5	2.5	67.7	2.7
44	Residential	Waterman	South of Olive	64.9	67.5	2.6	67.6	2.7
45	Residential	Waterman	South of Olive	73.9	76.5	2.6	76.6	2.7
46	Residential	Waterman	South of Olive	65.0	67.6	2.6	67.7	2.7
47	Residential	Waterman	South of Olive	56.5	59.0	2.5	59.1	2.6

*Source: Impact Sciences, Inc. Modeling results are provided in **Appendix A**.*
Note: The effect of any existing noise barriers were not taken into account in the modeling analysis.

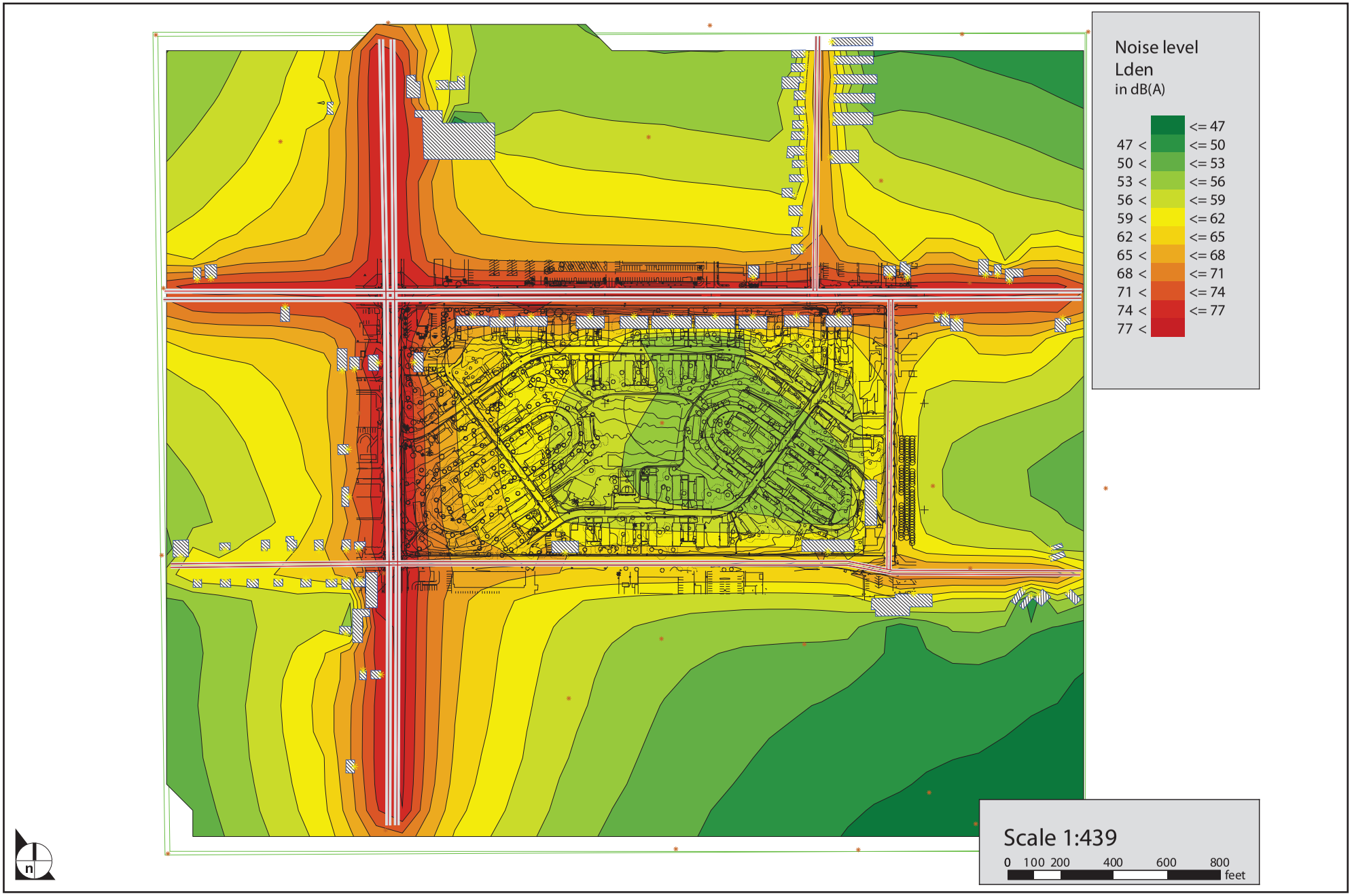


SOURCE Impact Sciences, Inc. – 2011

FIGURE 7

Cumulative Future (2030) Roadway Noise Contours - Without Project

1085.001•06/11



SOURCE: Impact Sciences, Inc. – 2011

FIGURE **8**

Future (2030) Roadway Noise Contours - With Project

1085-001•07/11

Table 6
Summary of Future 2013 and 2030 Noise Levels for Select On-Site Project Residents

Model ID	Receptor Type	Roadway	Future Opening Year (2013) Noise Level Ldn (dB(A))	Future Buildout Year (2030) Noise Level Ldn (dB(A))
69	Residential	Waterman	70.9	73.2
70	Residential	Base Line	70.3	72.6
76	Residential	Base Line	69.7	71.9
77	Residential	Base Line	69.7	71.9
78	Residential	Base Line	69.2	71.4
79	Residential	Base Line	69.2	71.4
80	Residential	Base Line	69.3	71.5
81	Residential	Base Line	69.3	71.5
82	Residential	Base Line	69.3	71.5
71	Residential	Base Line	69.7	71.9
72	Residential	Base Line	69.6	71.9
73	Residential	La Junita	59.6	61.9
74	Residential	Olive	61.5	63.4
75	Residential	Olive	62.4	64.3

*Source: Impact Sciences, Inc. Modeling results are provided in **Appendix A**.*
Note: The effect of any existing noise barriers were not taken into account in the modeling analysis.

Level of Significance before Mitigation Measures: Potentially significant impact.

Mitigation Measures: The proposed project will incorporate the following measures to reduce construction and on-site operational noise impacts.

MM NOISE-1 The project shall comply with Municipal Code Section 8.54.070, which prohibits "any work of construction, erection, alteration, repair, addition, movement, demolition, or improvement to any building or structure except within the hours of 7:00 a.m. and 8:00 p.m."

MM NOISE-2 The project shall comply with the following construction best management practices.

- Two weeks prior to the commencement of construction for any phase, notification must be provided to surrounding land uses within 1,000 feet of the project site disclosing the construction schedule, including various types of activities that would be occurring throughout the duration of each construction phase.

- Provide designated truck routes that minimize impacts on local traffic and neighborhoods.

- Schedule high noise-producing activities between the hours of 8:00 AM and 4:00 PM Monday through Saturday to minimize disruption to neighboring residential homes.
- Ensure that construction equipment is properly muffled according to industry standards and in good working condition.
- Place noise-generating construction equipment and locate construction staging areas away from residential homes.
- Use electric air compressors and similar power tools rather than diesel equipment to the extent that the necessary equipment are commercial available.
- Construction-related equipment, including heavy-duty equipment, motor vehicles, generators, air compressors, and other portable equipment, shall be turned off when not in use for more than 30 minutes.
- Construction vehicles and equipment outfitted with back-up alarms shall utilize "smart back-up alarms" that will generate sound at least five decibels louder than the surrounding noise instead of fixed-decibel back-up alarms.
- Construction hours, allowable workdays, and the phone number of the job superintendent shall be clearly posted at all construction entrances to allow for surrounding residents to contact the job superintendent. If the superintendent receives a complaint, the superintendent shall investigate, take appropriate corrective action, and report the action to the reporting party.

MM NOISE-3 The project shall be required to implement the following noise reduction features on Base Line Street and Waterman Avenue.

- The travel lane widths adjacent to the project site will be reduced from 12 feet down to 10 feet.
- On-street parking shall be provided in areas adjacent to the project site.
- Bicycle lanes shall be provided.
- A raised center median with dense ground vegetation or ground cover shall be provided.
- Trees and ground vegetation or ground cover shall be provided between the proposed residential buildings and travel lanes.
- Sidewalks shall be setback approximately 8 feet in areas adjacent to the project site.
- Two additional signalized intersections, compared to existing conditions, shall be added adjacent to the project site.

- The signalized intersection along Baseline Street adjacent to the project site, including the two additional proposed intersections, shall be set in progression such that vehicle speeds are reduced to approximately 30-35 miles per hour.

MM NOISE-4 The pavement along Base Line Street and Waterman Avenue in the area adjacent to the project site shall be upgraded with features and materials that reduce vehicle noise according to the following parameters.

- The pavement shall be upgraded with "quiet pavement" materials, such as rubberized pavement.
- The project site shall include planter strips along Base Line Street with dense vegetation or ground cover.
- The project site shall include "sitting walls" with landscaping materials along Base Line Street approximately 2 to 2.5 feet in height, that will act as noise barriers, with landscaping material placed toward the proposed residential buildings.

Level of Significance after Mitigation Measures: Less than significant impact.

Mitigation measures **MM NOISE-3**, and **MM NOISE-4**would reduce impacts to the senior housing units with balconies facing Waterman Avenue to a less than significant level. While the modeled mitigated noise levels would still be above the allowable sound level of 65 dB(A), the model is not able to include all the mitigation measures listed. If the effects of the remaining mitigation measures are included, the noise levels for on-site receptors along Waterman Avenue would be reduced to a level compliant with applicable noise ordinances.

Mitigation measures **MM NOISE-4** and **MM NOISE-5** would reduce impacts to the residential units along Base Line Street. Mitigation measure **MM NOISE-5** cannot be fully modeled using the SoundPlan noise model because no option exists to account for "quiet pavement", such as rubberized pavement, which is reasonably estimated to achieve noise reductions of 4 to 6 dB(A) or more (see **Appendix C**). Based on this information, mitigated noise levels to future on-site project residents are summarized in **Table 7, Summary of Future (2030) Mitigated Noise Levels for On-Site Project Residents along Base Line Street**. As shown, the noise levels would be mitigated to less than significant.

Table 7
Summary of Future (2030) Mitigated Noise Levels for On-Site Project Residents along Base Line Street

Model ID	Receptor Type	Roadway	Modeled Reduced Noise Levels* Ldn (dB(A))	Noise Reduction from Quiet Pavement Ldn (dB(A))	Estimated Mitigated Noise Level Ldn (dB(A))

Model ID	Receptor Type	Roadway	Modeled Reduced Noise Levels* Ldn (dB(A))	Noise Reduction from Quiet Pavement Ldn (dB(A))	Estimated Mitigated Noise Level Ldn (dB(A))
70	Residential	Base Line	67.8	-4 to -6	64
76	Residential	Base Line	68.8	-4 to -6	65
77	Residential	Base Line	68.2	-4 to -6	64
78	Residential	Base Line	68.6	-4 to -6	65
79	Residential	Base Line	68.6	-4 to -6	65
80	Residential	Base Line	68.6	-4 to -6	65
81	Residential	Base Line	68.7	-4 to -6	65
82	Residential	Base Line	68.6	-4 to -6	56
71	Residential	Base Line	69.1	-4 to -6	65
72	Residential	Base Line	69.0	-4 to -6	65

*Source: Impact Sciences, Inc. Modeling results are provided in **Appendix C**.*

** Note: Includes only those specific mitigation measures from **MM NOISE-4** and **MM NOISE-5** in which the model has the capability to account for the reduction in noise. For example, this column includes the effects of reduced vehicle speeds, decreased travel lane widths, center median, and increased distance to the roadway from the siting of sidewalks and bicycle lanes. The additional measures would reduce noise levels to a greater extent that shown in this table.*

Threshold: Expose persons to or generate excessive ground borne vibration or ground borne noise levels.

Construction Vibration

Construction activities can generate varying degrees of ground vibration, depending on the construction procedures and the construction equipment. The primary and most intensive vibration source associated with the development of the proposed project would be associated with the use of haul trucks and dozers during construction.[18] On-road haul trucks carrying demolition debris, soil, and building materials to and from the site would be the largest generator of ground-borne vibration since they would travel over roadways that are adjacent to sensitive land uses. Sensitive land uses located in the immediate vicinity of the project site include residences along Base Line Street and Waterman Avenue.

On-road trucks carrying demolition debris, soil, and building materials may also result in vibration impacts as they travel along roadways. Vibration impacts associated with on-road trucks only occur during one-half of a round trip, since trucks usually arrive or depart a construction site in an unloaded state. The operation of loaded trucks would result in a vibration velocity level of 82 VdB measured at 35 feet. Thus, the vibration levels generated by loaded trucks would be experienced infrequently and for

18 Based on the formula VdB = VdB(25ft) - 30 x LOG10 (D/25), where D is equal to the distance.

only a short time as a loaded truck travels along a roadway in the immediate vicinity of a sensitive receptor.[19] The operation of dozers within 100 feet of sensitive land uses could generate infrequent vibration levels of up to 69 VdB. The vibration levels generated by these equipment would be experienced infrequently because construction equipment generally do not operate continuously in a single location.

Based on the above analysis, loaded haul trucks and dozers would result in vibration impacts that are under the FTA vibration thresholds for both human annoyance and structural damage for infrequent vibration events and would therefore be less than significant. It should be noted that mitigation measure **MM NOISE-2** listed above would also reduce vibration levels.

Operational Vibration

The proposed project would not include any stationary equipment that would generate ground-borne vibration that would cause an annoyance to humans or any structural damage to buildings. During operation, the project would be served by trash trucks that would collect municipal solid waste. However, these trash trucks would be similar to trash trucks that already serve the existing surrounding residential and commercial land uses. Furthermore, as discussed under the construction impacts, loaded haul trucks would not result in vibration levels that exceed the thresholds of significance. Therefore, operational vibration events would be less than significant.

Level of Significance before Mitigation Measures: Less than significant impact.

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation Measures: Less than significant impact.

Threshold: Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

As previously discussed, operation of the project would result in an incremental increase in area traffic volumes above those that would occur without the project. Noise generated by vehicular traffic traveling on the local roadway network represents the predominant and most consistent noise source for the project. The increase in traffic would result in a permanent increase in ambient noise levels in the project vicinity above existing levels. As shown in **Table 5**, the increase in noise levels would be under 3 dB(A) except along Olive Street where the increase could be 3.5 dB(A), which is above the threshold of human

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19 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06)*, (2006) 12-11 and 12-12.

perception. However, noise levels at sensitive receptors along Olive Street are expected to be below the City of San Bernardino noise threshold of 65 dB(A) for noise sensitive uses because of the relatively low traffic volumes. Therefore, this would not be considered a substantial noise increase and the impact is considered to be less than significant.

Level of Significance before Mitigation Measures: Less than significant impact.

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation Measures: Less than significant impact.

Threshold: Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Temporary or periodic increases in ambient noise levels would result from construction activity. As previously discussed, the City regulates noise-generating activities through the Municipal Code Section 8.54.020, which limits the hours of construction activities. As shown in **Table 3**, construction noise would be approximately 80.5 dB(A) Lmax and 76.0 dB(A) Leq at noise sensitive land uses. Mitigation of construction noise impacts to a level that is less than significant would be conducted through the enforcement of the San Bernardino Municipal Code and in a broader sense through the policies of the General Plan Noise Element. The project would be required to implement mitigation measures **MM NOISE-1** and **MM NOISE-2** to reduce noise impacts to less than significant.

The California Division of Occupational Health and Safety (CalOSHA) provides guidelines to protect the hearing of people employed in the State of California. An employer is required to administer a continuing effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85.0 dB(A) (referred to as the "action level"), or equivalently, a dose of 50 percent.[20] Furthermore, according to the California Department of Transportation (Caltrans), noises levels of 85.0 dB(A) are considered "normal" noise level for freeways.[21] As shown in **Table 3**, construction activities would not generate noise levels, even on a temporary or short-term basis, that would exceed the CalOSHA noise "action level" for employers or the Caltrans "normal" noise level for freeways. Therefore, it is reasonably concluded that the temporary and periodic construction noise levels associated with the project would not pose a risk to human hearing at off-site sensitive receptors**.**

Level of Significance before Mitigation Measures: Potentially significant impact.

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20 California Code of Regulations, Title 8, Section 5097, Hearing Conservation Program.

21 California Department of Transportation, *Caltrans Safety Manual*, Chapter 13 Hearing Protection Program, (1996) 13-5.

Mitigation Measures: The project is required to implement mitigation measures **MM NOISE-1** and **MM NOISE-2** (listed previously).

Level of Significance after Mitigation Measures: Less than significant impact.

7.0 CONCLUSION

The noise assessment for the proposed Waterman Gardens Master Plan Project, located at the intersection of Waterman Avenue and East Base Line Street in San Bernardino, California, provides the estimated noise contribution to the existing noise environment from the construction and operation of the proposed project. Construction of the project result in periodic noise levels that exceed the existing noise levels in the project area. Mitigation of construction noise impacts to a level that is less than significant would be conducted through the enforcement of the San Bernardino Municipal Code and in a broader sense through the policies of the General Plan Noise Element. This assessment recommends that the project incorporate best available control practices, in accordance with the General Plan and industry-standard practices, to control and reduce construction-related noise. With the implementation of these measures and compliance with the San Bernardino Municipal Code, construction noise impacts would be less than significant. During construction, the project would use dozers and haul trucks that would produce some level of groundborne vibrations. However, vibrations during construction would not exceed the threshold of significance.

Operation of the project would result in an incremental increase in noise due to project-related automobiles and trucks. Traffic in the region would increase without the project increasing the odds that the project could contribute to a noise impact. However, as shown in this assessment, the increase in noise levels would be under 3 dB(A) except along Olive Street where the increase could be 3.5 dB(A), which is above the threshold of human perception. However, noise levels at sensitive receptors along Olive Street are expected to be below the City of San Bernardino noise threshold of 65 dB(A) for noise sensitive uses because of the relatively low traffic volumes. Therefore, this would not be considered a substantial noise increase and the project would result in a less than significant impact during operation. Nonetheless, the project would locate future residents on-site that could be exposed to noise levels in excess of 65 dB(A), particularly at residential units construction on-site along Waterman Avenue and Base Line Street. Therefore, impacts to on-site residents are considered potentially significant and mitigation measures are recommended to reduce the impact to less than significant.

APPENDIX A

Operational Noise Calculations and Model Files

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 1
N/S Street: E Street
E/W Street: Base Line Street
Source: Fehr & Peers, *Draft Waterman Gardens Master Plan Traffic Impact Analysis* , (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

E Street

Southbound

Scenario	right <	through v	left >
Existing	125	517	116
2013 Without Project	132	548	123
2013 With Project	132	548	134
2030 Without Project	219	906	203
2030 With Project	219	906	214

Base Line Street

Eastbound

Scenario	left ^	through >	right v
Existing	88	1,038	61
2013 Without Project	93	1,101	65
2013 With Project	93	1,155	65
2030 Without Project	154	1,833	107
2030 With Project	154	1,887	107

Westbound

Scenario	right ^	through <	left v
Existing	124	1,228	61
2013 Without Project	131	1,302	65
2013 With Project	144	1,367	78
2030 Without Project	217	2,165	107
2030 With Project	230	2,230	120

Northbound

Scenario	left <	through ^	right >
Existing	84	486	109
2013 Without Project	89	515	116
2013 With Project	89	515	127
2030 Without Project	147	852	191
2030 With Project	147	852	202

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

E Street

Segment North of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	6,317	5,817
2013 Without Project	6,692	6,158
2013 With Project	6,783	6,267
2030 Without Project	11,067	10,192
2030 With Project	11,158	10,300

Base Line Street

Segment West of: E Street

Scenario	Traveling Direction WB	EB
Existing	11,975	9,892
2013 Without Project	12,692	10,492
2013 With Project	13,233	10,942
2030 Without Project	21,092	17,450
2030 With Project	21,633	17,900

Segment East of: E Street

Scenario	Traveling Direction WB	EB
Existing	11,775	10,525
2013 Without Project	12,483	11,167
2013 With Project	13,242	11,800
2030 Without Project	20,742	18,558
2030 With Project	21,500	19,192

Segment South of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	5,325	5,658
2013 Without Project	5,650	6,000
2013 With Project	5,758	6,092
2030 Without Project	9,333	9,917
2030 With Project	9,442	10,008

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
E Street						
Segment North of:	Base Line Street					
Auto	316	53	37	291	48	34
Med Truck	47	11	5	44	10	5
Hvy Truck	32	5	11	29	5	10
Buses	3	3		2	2	
Mcycle	3			2		
Auxiliary	3			2		
E Street						
Segment South of:	Base Line Street					
Auto	266	44	31	283	47	33
Med Truck	40	9	4	42	9	5
Hvy Truck	27	4	9	28	5	9
Buses	2	2		2	2	
Mcycle	2			2		
Auxiliary	2			2		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	E Street					
Auto	599	100	70	495	82	58
Med Truck	90	20	10	74	16	8
Hvy Truck	60	10	20	49	8	16
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Base Line Street						
Segment East of:	E Street					
Auto	589	98	69	526	88	61
Med Truck	88	20	10	79	18	9
Hvy Truck	59	10	20	53	9	18
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
E Street						
Segment North of:	Base Line Street					
Auto	335	56	39	308	51	36
Med Truck	50	11	6	46	10	5
Hvy Truck	33	6	11	31	5	10
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		
E Street						
Segment South of:	Base Line Street					
Auto	283	47	33	300	50	35
Med Truck	42	9	5	45	10	5
Hvy Truck	28	5	9	30	5	10
Buses	2	2		3	3	
Mcycle	2			3		
Auxiliary	2			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	E Street					
Auto	635	106	74	525	87	61
Med Truck	95	21	11	79	17	9
Hvy Truck	63	11	21	52	9	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Base Line Street						
Segment East of:	E Street					
Auto	624	104	73	558	93	65
Med Truck	94	21	10	84	19	9
Hvy Truck	62	10	21	56	9	19
Buses	5	5		5	5	
Mcycle	5			5		
Auxiliary	5			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
E Street						
Segment North of:	Base Line Street					
Auto	339	57	40	313	52	37
Med Truck	51	11	6	47	10	5
Hvy Truck	34	6	11	31	5	10
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		
E Street						
Segment South of:	Base Line Street					
Auto	288	48	34	305	51	36
Med Truck	43	10	5	46	10	5
Hvy Truck	29	5	10	30	5	10
Buses	2	2		3	3	
Mcycle	2			3		
Auxiliary	2			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	E Street					
Auto	662	110	77	547	91	64
Med Truck	99	22	11	82	18	9
Hvy Truck	66	11	22	55	9	18
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		
Base Line Street						
Segment East of:	E Street					
Auto	662	110	77	590	98	69
Med Truck	99	22	11	89	20	10
Hvy Truck	66	11	22	59	10	20
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
E Street						
Segment North of:	Base Line Street					
Auto	553	92	65	510	85	59
Med Truck	83	18	9	76	17	8
Hvy Truck	55	9	18	51	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
E Street						
Segment South of:	Base Line Street					
Auto	467	78	54	496	83	58
Med Truck	70	16	8	74	17	8
Hvy Truck	47	8	16	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	E Street					
Auto	1,055	176	123	873	145	102
Med Truck	158	35	18	131	29	15
Hvy Truck	105	18	35	87	15	29
Buses	9	9		7	7	
Mcycle	9			7		
Auxiliary	9			7		
Base Line Street						
Segment East of:	E Street					
Auto	1,037	173	121	928	155	108
Med Truck	156	35	17	139	31	15
Hvy Truck	104	17	35	93	15	31
Buses	9	9		8	8	
Mcycle	9			8		
Auxiliary	9			8		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
E Street						
Segment North of:	Base Line Street					
Auto	558	93	65	515	86	60
Med Truck	84	19	9	77	17	9
Hvy Truck	56	9	19	52	9	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
E Street						
Segment South of:	Base Line Street					
Auto	472	79	55	500	83	58
Med Truck	71	16	8	75	17	8
Hvy Truck	47	8	16	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	E Street					
Auto	1,082	180	126	895	149	104
Med Truck	162	36	18	134	30	15
Hvy Truck	108	18	36	90	15	30
Buses	9	9		7	7	
Mcycle	9			7		
Auxiliary	9			7		
Base Line Street						
Segment East of:	E Street					
Auto	1,075	179	125	960	160	112
Med Truck	161	36	18	144	32	16
Hvy Truck	108	18	36	96	16	32
Buses	9	9		8	8	
Mcycle	9			8		
Auxiliary	9			8		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 2
N/S Street: Waterman Avenue
E/W Street: Highland Avenue
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Waterman Avenue

Southbound

Scenario	right <	through v	left >
Existing	56	976	215
2013 Without Project	60	1,035	228
2013 With Project	60	1,056	228
2030 Without Project	98	1,814	377
2030 With Project	98	1,835	377

Highland Avenue

Eastbound

Scenario	left ^	through >	right v
Existing	142	780	278
2013 Without Project	150	828	295
2013 With Project	150	828	305
2030 Without Project	249	1,409	487
2030 With Project	249	1,409	497

Westbound

Scenario	right ^	through <	left v
Existing	123	836	193
2013 Without Project	131	887	205
2013 With Project	131	887	215
2030 Without Project	215	1,503	339
2030 With Project	215	1,503	349

Northbound

Scenario	left <	through ^	right >
Existing	246	929	225
2013 Without Project	261	986	239
2013 With Project	274	1,013	252
2030 Without Project	431	1,726	395
2030 With Project	444	1,753	408

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Waterman Avenue

Segment North of: Highland Avenue

Scenario	Traveling Direction SB	NB
Existing	10,392	9,950
2013 Without Project	11,025	10,558
2013 With Project	11,200	10,783
2030 Without Project	19,075	18,250
2030 With Project	19,250	18,475

Highland Avenue

Segment West of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	9,483	10,000
2013 Without Project	10,067	10,608
2013 With Project	10,175	10,692
2030 Without Project	16,933	17,875
2030 With Project	17,042	17,958

Segment East of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	9,600	10,167
2013 Without Project	10,192	10,792
2013 With Project	10,275	10,900
2030 Without Project	17,142	18,175
2030 With Project	17,225	18,283

500

Segment South of: Highland Avenue

Scenario	Traveling Direction SB	NB
Existing	12,058	11,667
2013 Without Project	12,792	12,383
2013 With Project	13,133	12,825
2030 Without Project	22,000	21,267
2030 With Project	22,342	21,708

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Highland Avenue					
Auto	520	87	61	498	83	58
Med Truck	78	17	9	75	17	8
Hvy Truck	52	9	17	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Waterman Avenue						
Segment South of:	Highland Avenue					
Auto	603	100	70	583	97	68
Med Truck	90	20	10	88	19	10
Hvy Truck	60	10	20	58	10	19
Buses	5	5		5	5	
Mcycle	5			5		
Auxiliary	5			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Highland Avenue						
Segment West of:	Waterman Avenue					
Auto	474	79	55	500	83	58
Med Truck	71	16	8	75	17	8
Hvy Truck	47	8	16	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Highland Avenue						
Segment East of:	Waterman Avenue					
Auto	480	80	56	508	85	59
Med Truck	72	16	8	76	17	8
Hvy Truck	48	8	16	51	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Highland Avenue					
Auto	551	92	64	528	88	62
Med Truck	83	18	9	79	18	9
Hvy Truck	55	9	18	53	9	18
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Waterman Avenue						
Segment South of:	Highland Avenue					
Auto	640	107	75	619	103	72
Med Truck	96	21	11	93	21	10
Hvy Truck	64	11	21	62	10	21
Buses	5	5		5	5	
Mcycle	5			5		
Auxiliary	5			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Highland Avenue						
Segment West of:	Waterman Avenue					
Auto	503	84	59	530	88	62
Med Truck	76	17	8	80	18	9
Hvy Truck	50	8	17	53	9	18
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Highland Avenue						
Segment East of:	Waterman Avenue					
Auto	510	85	59	540	90	63
Med Truck	76	17	8	81	18	9
Hvy Truck	51	8	17	54	9	18
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Highland Avenue					
Auto	560	93	65	539	90	63
Med Truck	84	19	9	81	18	9
Hvy Truck	56	9	19	54	9	18
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Waterman Avenue						
Segment South of:	Highland Avenue					
Auto	657	109	77	641	107	75
Med Truck	99	22	11	96	21	11
Hvy Truck	66	11	22	64	11	21
Buses	5	5		5	5	
Mcycle	5			5		
Auxiliary	5			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Highland Avenue						
Segment West of:	Waterman Avenue					
Auto	509	85	59	535	89	62
Med Truck	76	17	8	80	18	9
Hvy Truck	51	8	17	53	9	18
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Highland Avenue						
Segment East of:	Waterman Avenue					
Auto	514	86	60	545	91	64
Med Truck	77	17	9	82	18	9
Hvy Truck	51	9	17	55	9	18
Buses	4	4		5	5	
Mcycle	4			5		
Auxiliary	4			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Waterman Avenue						
Segment North of:	Highland Avenue					
Auto	954	159	111	913	152	106
Med Truck	143	32	16	137	30	15
Hvy Truck	95	16	32	91	15	30
Buses	8	8		8	8	
Mcycle	8			8		
Auxiliary	8			8		
Waterman Avenue						
Segment South of:	Highland Avenue					
Auto	1,100	183	128	1,063	177	124
Med Truck	165	37	18	160	35	18
Hvy Truck	110	18	37	106	18	35
Buses	9	9		9	9	
Mcycle	9			9		
Auxiliary	9			9		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Highland Avenue						
Segment West of:	Waterman Avenue					
Auto	847	141	99	894	149	104
Med Truck	127	28	14	134	30	15
Hvy Truck	85	14	28	89	15	30
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Highland Avenue						
Segment East of:	Waterman Avenue					
Auto	857	143	100	909	151	106
Med Truck	129	29	14	136	30	15
Hvy Truck	86	14	29	91	15	30
Buses	7	7		8	8	
Mcycle	7			8		
Auxiliary	7			8		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Highland Avenue					
Auto	963	160	112	924	154	108
Med Truck	144	32	16	139	31	15
Hvy Truck	96	16	32	92	15	31
Buses	8	8		8	8	
Mcycle	8			8		
Auxiliary	8			8		
Waterman Avenue						
Segment South of:	Highland Avenue					
Auto	1,117	186	130	1,085	181	127
Med Truck	168	37	19	163	36	18
Hvy Truck	112	19	37	109	18	36
Buses	9	9		9	9	
Mcycle	9			9		
Auxiliary	9			9		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Highland Avenue						
Segment West of:	Waterman Avenue					
Auto	852	142	99	898	150	105
Med Truck	128	28	14	135	30	15
Hvy Truck	85	14	28	90	15	30
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Highland Avenue						
Segment East of:	Waterman Avenue					
Auto	861	144	100	914	152	107
Med Truck	129	29	14	137	30	15
Hvy Truck	86	14	29	91	15	30
Buses	7	7		8	8	
Mcycle	7			8		
Auxiliary	7			8		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 3
N/S Street: Waterman Avenue
E/W Street: Base Line Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Waterman Avenue

Southbound

Scenario	right <	through v	left >
Existing	186	1,161	99
2013 Without Project	197	1,232	105
2013 With Project	197	1,257	121
2030 Without Project	326	2,138	173
2030 With Project	326	2,163	189

Eastbound

Scenario	left ^	through >	right v
Existing	172	749	185
2013 Without Project	182	794	196
2013 With Project	182	835	231
2030 Without Project	302	1,326	324
2030 With Project	302	1,367	359

Westbound

Scenario	right ^	through <	left v
Existing	121	823	254
2013 Without Project	128	873	269
2013 With Project	150	921	269
2030 Without Project	212	1,454	479
2030 With Project	234	1,502	479

Northbound

Scenario	left <	through ^	right >
Existing	173	906	235
2013 Without Project	183	961	250
2013 With Project	226	992	250
2030 Without Project	303	1,686	444
2030 With Project	346	1,717	444

Base Line Street

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Waterman Avenue

Segment North of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	12,050	9,992
2013 Without Project	12,783	10,592
2013 With Project	13,125	11,033
2030 Without Project	21,975	18,333
2030 With Project	22,317	18,775

Segment West of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	9,850	9,217
2013 Without Project	10,442	9,767
2013 With Project	11,200	10,400
2030 Without Project	17,358	16,267
2030 With Project	18,117	16,900

Segment East of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	9,983	9,025
2013 Without Project	10,583	9,575
2013 With Project	11,167	10,050
2030 Without Project	17,875	16,192
2030 With Project	18,458	16,667

Base Line Street

500

Segment South of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	13,333	10,950
2013 Without Project	14,142	11,617
2013 With Project	14,642	12,233
2030 Without Project	24,508	20,275
2030 With Project	25,008	20,892

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Base Line Street					
Auto	603	100	70	500	83	58
Med Truck	90	20	10	75	17	8
Hvy Truck	60	10	20	50	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Waterman Avenue						
Segment South of:	Base Line Street					
Auto	667	111	78	548	91	64
Med Truck	100	22	11	82	18	9
Hvy Truck	67	11	22	55	9	18
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Waterman Avenue					
Auto	493	82	57	461	77	54
Med Truck	74	16	8	69	15	8
Hvy Truck	49	8	16	46	8	15
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Waterman Avenue					
Auto	499	83	58	451	75	53
Med Truck	75	17	8	68	15	8
Hvy Truck	50	8	17	45	8	15
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Base Line Street					
Auto	639	107	75	530	88	62
Med Truck	96	21	11	79	18	9
Hvy Truck	64	11	21	53	9	18
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Waterman Avenue						
Segment South of:	Base Line Street					
Auto	707	118	82	581	97	68
Med Truck	106	24	12	87	19	10
Hvy Truck	71	12	24	58	10	19
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Waterman Avenue					
Auto	522	87	61	488	81	57
Med Truck	78	17	9	73	16	8
Hvy Truck	52	9	17	49	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Waterman Avenue					
Auto	529	88	62	479	80	56
Med Truck	79	18	9	72	16	8
Hvy Truck	53	9	18	48	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Base Line Street					
Auto	656	109	77	552	92	64
Med Truck	98	22	11	83	18	9
Hvy Truck	66	11	22	55	9	18
Buses	5	5		5	5	
Mcycle	5			5		
Auxiliary	5			5		
Waterman Avenue						
Segment South of:	Base Line Street					
Auto	732	122	85	612	102	71
Med Truck	110	24	12	92	20	10
Hvy Truck	73	12	24	61	10	20
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Waterman Avenue					
Auto	560	93	65	520	87	61
Med Truck	84	19	9	78	17	9
Hvy Truck	56	9	19	52	9	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Base Line Street						
Segment East of:	Waterman Avenue					
Auto	558	93	65	503	84	59
Med Truck	84	19	9	75	17	8
Hvy Truck	56	9	19	50	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030 No Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Base Line Street					
Auto	1,099	183	128	917	153	107
Med Truck	165	37	18	138	31	15
Hvy Truck	110	18	37	92	15	31
Buses	9	9		8	8	
Mcycle	9			8		
Auxiliary	9			8		
Waterman Avenue						
Segment South of:	Base Line Street					
Auto	1,225	204	143	1,014	169	118
Med Truck	184	41	20	152	34	17
Hvy Truck	123	20	41	101	17	34
Buses	10	10		8	8	
Mcycle	10			8		
Auxiliary	10			8		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 No Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Waterman Avenue					
Auto	868	145	101	813	136	95
Med Truck	130	29	14	122	27	14
Hvy Truck	87	14	29	81	14	27
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Base Line Street						
Segment East of:	Waterman Avenue					
Auto	894	149	104	810	135	94
Med Truck	134	30	15	121	27	13
Hvy Truck	89	15	30	81	13	27
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Base Line Street					
Auto	1,116	186	130	939	156	110
Med Truck	167	37	19	141	31	16
Hvy Truck	112	19	37	94	16	31
Buses	9	9		8	8	
Mcycle	9			8		
Auxiliary	9			8		
Waterman Avenue						
Segment South of:	Base Line Street					
Auto	1,250	208	146	1,045	174	122
Med Truck	188	42	21	157	35	17
Hvy Truck	125	21	42	104	17	35
Buses	10	10		9	9	
Mcycle	10			9		
Auxiliary	10			9		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Waterman Avenue					
Auto	906	151	106	845	141	99
Med Truck	136	30	15	127	28	14
Hvy Truck	91	15	30	85	14	28
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		
Base Line Street						
Segment East of:	Waterman Avenue					
Auto	923	154	108	833	139	97
Med Truck	138	31	15	125	28	14
Hvy Truck	92	15	31	83	14	28
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 4
N/S Street: Waterman Avenue
E/W Street: Driveway/Orange St
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Waterman Avenue

Southbound

Scenario	right <	through v	left >
Existing	24	1,704	58
2013 Without Project	25	1,807	62
2013 With Project	25	1,807	122
2030 Without Project	42	3,123	102
2030 With Project	42	3,123	162

Driveway/Orange St

Eastbound

Scenario	left ^	through >	right v
Existing	6		14
2013 Without Project	6		15
2013 With Project	6		15
2030 Without Project	11		24
2030 With Project	11		24

Westbound

Scenario	right ^	through <	left v
Existing	54	1	63
2013 Without Project	57	1	67
2013 With Project	131	1	110
2030 Without Project	95	2	111
2030 With Project	169	2	154

Northbound

Scenario	left <	through ^	right >
Existing	25	1,523	50
2013 Without Project	26	1,616	53
2013 With Project	26	1,616	89
2030 Without Project	44	2,800	88
2030 With Project	44	2,800	124

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Waterman Avenue

Segment North of: Driveway/Orange St

Scenario	Traveling Direction SB	NB
Existing	14,883	13,192
2013 Without Project	15,783	13,992
2013 With Project	16,283	14,608
2030 Without Project	27,225	24,217
2030 With Project	27,725	24,833

Driveway/Orange St

Segment West of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	417	167
2013 Without Project	433	175
2013 With Project	433	175
2030 Without Project	733	292
2030 With Project	733	292

Segment East of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	983	900
2013 Without Project	1,042	958
2013 With Project	2,017	1,758
2030 Without Project	1,733	1,583
2030 With Project	2,708	2,383

500

Segment South of: Driveway/Orange St

Scenario	Traveling Direction SB	NB
Existing	14,842	13,317
2013 Without Project	15,742	14,125
2013 With Project	16,100	14,425
2030 Without Project	27,150	24,433
2030 With Project	27,508	24,733

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Driveway/Orange St					
Auto	744	124	87	660	110	77
Med Truck	112	25	12	99	22	11
Hvy Truck	74	12	25	66	11	22
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		
Waterman Avenue						
Segment South of:	Driveway/Orange St					
Auto	742	124	87	666	111	78
Med Truck	111	25	12	100	22	11
Hvy Truck	74	12	25	67	11	22
Buses	6	6		6	6	
Mcycle	6			6		
Auxiliary	6			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Driveway/Orange St						
Segment West of:	Waterman Avenue					
Auto	21	3	2	8	1	1
Med Truck	3	1	0	1	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Driveway/Orange St						
Segment East of:	Waterman Avenue					
Auto	49	8	6	45	8	5
Med Truck	7	2	1	7	2	1
Hvy Truck	5	1	2	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Driveway/Orange St					
Auto	789	132	92	700	117	82
Med Truck	118	26	13	105	23	12
Hvy Truck	79	13	26	70	12	23
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		
Waterman Avenue						
Segment South of:	Driveway/Orange St					
Auto	787	131	92	706	118	82
Med Truck	118	26	13	106	24	12
Hvy Truck	79	13	26	71	12	24
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Driveway/Orange St						
Segment West of:	Waterman Avenue					
Auto	22	4	3	9	1	1
Med Truck	3	1	0	1	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Driveway/Orange St						
Segment East of:	Waterman Avenue					
Auto	52	9	6	48	8	6
Med Truck	8	2	1	7	2	1
Hvy Truck	5	1	2	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Driveway/Orange St					
Auto	814	136	95	730	122	85
Med Truck	122	27	14	110	24	12
Hvy Truck	81	14	27	73	12	24
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		
Waterman Avenue						
Segment South of:	Driveway/Orange St					
Auto	805	134	94	721	120	84
Med Truck	121	27	13	108	24	12
Hvy Truck	81	13	27	72	12	24
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Driveway/Orange St						
Segment West of:	Waterman Avenue					
Auto	22	4	3	9	1	1
Med Truck	3	1	0	1	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Driveway/Orange St						
Segment East of:	Waterman Avenue					
Auto	101	17	12	88	15	10
Med Truck	15	3	2	13	3	1
Hvy Truck	10	2	3	9	1	3
Buses	1	1		1	1	
Mcycle	1			1		
Auxiliary	1			1		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Driveway/Orange St					
Auto	1,361	227	159	1,211	202	141
Med Truck	204	45	23	182	40	20
Hvy Truck	136	23	45	121	20	40
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		
Waterman Avenue						
Segment South of:	Driveway/Orange St					
Auto	1,358	226	158	1,222	204	143
Med Truck	204	45	23	183	41	20
Hvy Truck	136	23	45	122	20	41
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Driveway/Orange St						
Segment West of:	Waterman Avenue					
Auto	37	6	4	15	2	2
Med Truck	6	1	1	2	0	0
Hvy Truck	4	1	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Driveway/Orange St						
Segment East of:	Waterman Avenue					
Auto	87	14	10	79	13	9
Med Truck	13	3	1	12	3	1
Hvy Truck	9	1	3	8	1	3
Buses	1	1		1	1	
Mcycle	1			1		
Auxiliary	1			1		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Driveway/Orange St					
Auto	1,386	231	162	1,242	207	145
Med Truck	208	46	23	186	41	21
Hvy Truck	139	23	46	124	21	41
Buses	12	12		10	10	
Mcycle	12			10		
Auxiliary	12			10		
Waterman Avenue						
Segment South of:	Driveway/Orange St					
Auto	1,375	229	160	1,237	206	144
Med Truck	206	46	23	186	41	21
Hvy Truck	138	23	46	124	21	41
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Driveway/Orange St						
Segment West of:	Waterman Avenue					
Auto	37	6	4	15	2	2
Med Truck	6	1	1	2	0	0
Hvy Truck	4	1	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Driveway/Orange St						
Segment East of:	Waterman Avenue					
Auto	135	23	16	119	20	14
Med Truck	20	5	2	18	4	2
Hvy Truck	14	2	5	12	2	4
Buses	1	1		1	1	
Mcycle	1			1		
Auxiliary	1			1		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 5
N/S Street: Waterman Avenue
E/W Street: Olive Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Waterman Avenue

Southbound

Scenario	right <	through v	left >
Existing	14	1,724	51
2013 Without Project	15	1,829	54
2013 With Project	15	1,872	54
2030 Without Project	25	3,158	90
2030 With Project	25	3,201	90

Olive Street

Eastbound

Scenario	left ^	through >	right v
Existing	9	4	17
2013 Without Project	9	4	18
2013 With Project	9	4	18
2030 Without Project	16	7	30
2030 With Project	16	7	30

Westbound

Scenario	right ^	through <	left v
Existing	30	3	29
2013 Without Project	32	3	31
2013 With Project	32	3	50
2030 Without Project	53	6	51
2030 With Project	53	6	70

Northbound

Scenario	left <	through ^	right >
Existing	26	1,473	48
2013 Without Project	27	1,563	51
2013 With Project	27	1,599	67
2030 Without Project	46	2,712	84
2030 With Project	46	2,748	100

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Waterman Avenue

Segment North of: Olive Street

Scenario	Traveling Direction SB	NB
Existing	14,908	12,600
2013 Without Project	15,817	13,367
2013 With Project	16,175	13,667
2030 Without Project	27,275	23,175
2030 With Project	27,633	23,475

Olive Street

Segment West of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	358	250
2013 Without Project	375	258
2013 With Project	375	258
2030 Without Project	642	442
2030 With Project	642	442

Segment East of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	517	858
2013 Without Project	550	908
2013 With Project	708	1,042
2030 Without Project	917	1,508
2030 With Project	1,075	1,642

500

Segment South of: Olive Street

Scenario	Traveling Direction SB	NB
Existing	14,750	12,892
2013 Without Project	15,650	13,675
2013 With Project	16,167	14,108
2030 Without Project	26,992	23,683
2030 With Project	27,508	24,117

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Olive Street					
Auto	745	124	87	630	105	74
Med Truck	112	25	12	95	21	11
Hvy Truck	75	12	25	63	11	21
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		
Waterman Avenue						
Segment South of:	Olive Street					
Auto	738	123	86	645	107	75
Med Truck	111	25	12	97	21	11
Hvy Truck	74	12	25	64	11	21
Buses	6	6		5	5	
Mcycle	6			5		
Auxiliary	6			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Olive Street						
Segment West of:	Waterman Avenue					
Auto	18	3	2	13	2	1
Med Truck	3	1	0	2	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Olive Street						
Segment East of:	Waterman Avenue					
Auto	26	4	3	43	7	5
Med Truck	4	1	0	6	1	1
Hvy Truck	3	0	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	Olive Street					
Auto	791	132	92	668	111	78
Med Truck	119	26	13	100	22	11
Hvy Truck	79	13	26	67	11	22
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		
Waterman Avenue						
Segment South of:	Olive Street					
Auto	783	130	91	684	114	80
Med Truck	117	26	13	103	23	11
Hvy Truck	78	13	26	68	11	23
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Olive Street						
Segment West of:	Waterman Avenue					
Auto	19	3	2	13	2	2
Med Truck	3	1	0	2	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Olive Street						
Segment East of:	Waterman Avenue					
Auto	28	5	3	45	8	5
Med Truck	4	1	0	7	2	1
Hvy Truck	3	0	1	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Olive Street					
Auto	809	135	94	683	114	80
Med Truck	121	27	13	103	23	11
Hvy Truck	81	13	27	68	11	23
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		
Waterman Avenue						
Segment South of:	Olive Street					
Auto	808	135	94	705	118	82
Med Truck	121	27	13	106	24	12
Hvy Truck	81	13	27	71	12	24
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Olive Street						
Segment West of:	Waterman Avenue					
Auto	19	3	2	13	2	2
Med Truck	3	1	0	2	0	0
Hvy Truck	2	0	1	1	0	0
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Olive Street						
Segment East of:	Waterman Avenue					
Auto	35	6	4	52	9	6
Med Truck	5	1	1	8	2	1
Hvy Truck	4	1	1	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030 No Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Olive Street					
Auto	1,364	227	159	1,159	193	135
Med Truck	205	45	23	174	39	19
Hvy Truck	136	23	45	116	19	39
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		
Waterman Avenue						
Segment South of:	Olive Street					
Auto	1,350	225	157	1,184	197	138
Med Truck	202	45	22	178	39	20
Hvy Truck	135	22	45	118	20	39
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 No Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Olive Street						
Segment West of:	Waterman Avenue					
Auto	32	5	4	22	4	3
Med Truck	5	1	1	3	1	0
Hvy Truck	3	1	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Olive Street						
Segment East of:	Waterman Avenue					
Auto	46	8	5	75	13	9
Med Truck	7	2	1	11	3	1
Hvy Truck	5	1	2	8	1	3
Buses	0	0		1	1	
Mcycle	0			1		
Auxiliary	0			1		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	Olive Street					
Auto	1,382	230	161	1,174	196	137
Med Truck	207	46	23	176	39	20
Hvy Truck	138	23	46	117	20	39
Buses	12	12		10	10	
Mcycle	12			10		
Auxiliary	12			10		
Waterman Avenue						
Segment South of:	Olive Street					
Auto	1,375	229	160	1,206	201	141
Med Truck	206	46	23	181	40	20
Hvy Truck	138	23	46	121	20	40
Buses	11	11		10	10	
Mcycle	11			10		
Auxiliary	11			10		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Olive Street						
Segment West of:	Waterman Avenue					
Auto	32	5	4	22	4	3
Med Truck	5	1	1	3	1	0
Hvy Truck	3	1	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Olive Street						
Segment East of:	Waterman Avenue					
Auto	54	9	6	82	14	10
Med Truck	8	2	1	12	3	1
Hvy Truck	5	1	2	8	1	3
Buses	0	0		1	1	
Mcycle	0			1		
Auxiliary	0			1		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 6
N/S Street: Waterman Avenue
E/W Street: 5th Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Waterman Avenue

Southbound

Scenario	right <	through v	left >
Existing	184	1,519	58
2013 Without Project	195	1,611	61
2013 With Project	195	1,673	61
2030 Without Project	323	2,798	101
2030 With Project	323	2,860	101

5th Street

Eastbound

Scenario	left ^	through >	right v
Existing	174	547	241
2013 Without Project	185	581	256
2013 With Project	185	581	256
2030 Without Project	305	959	422
2030 With Project	305	959	422

Westbound

Scenario	right ^	through <	left v
Existing	74	451	127
2013 Without Project	79	479	135
2013 With Project	79	479	135
2030 Without Project	130	791	222
2030 With Project	130	791	222

Northbound

Scenario	left <	through ^	right >
Existing	156	1,493	145
2013 Without Project	165	1,584	154
2013 With Project	165	1,636	154
2030 Without Project	273	2,747	254
2030 With Project	273	2,799	254

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Waterman Avenue

Segment North of: 5th Street

Scenario	Traveling Direction SB	NB
Existing	14,675	14,508
2013 Without Project	15,558	15,400
2013 With Project	16,075	15,833
2030 Without Project	26,850	26,517
2030 With Project	27,367	26,950

5th Street

Segment West of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	6,592	8,017
2013 Without Project	6,992	8,517
2013 With Project	6,992	8,517
2030 Without Project	11,558	14,050
2030 With Project	11,558	14,050

Segment East of: Waterman Avenue

Scenario	Traveling Direction WB	EB
Existing	5,433	6,250
2013 Without Project	5,775	6,633
2013 With Project	5,775	6,633
2030 Without Project	9,525	10,950
2030 With Project	9,525	10,950

500

Segment South of: 5th Street

Scenario	Traveling Direction SB	NB
Existing	15,725	14,950
2013 Without Project	16,683	15,858
2013 With Project	17,200	16,292
2030 Without Project	28,683	27,283
2030 With Project	29,200	27,717

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	5th Street					
Auto	734	122	86	725	121	85
Med Truck	110	24	12	109	24	12
Hvy Truck	73	12	24	73	12	24
Buses	6	6		6	6	
Mcycle	6			6		
Auxiliary	6			6		
Waterman Avenue						
Segment South of:	5th Street					
Auto	786	131	92	748	125	87
Med Truck	118	26	13	112	25	12
Hvy Truck	79	13	26	75	12	25
Buses	7	7		6	6	
Mcycle	7			6		
Auxiliary	7			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
5th Street						
Segment West of:	Waterman Avenue					
Auto	330	55	38	401	67	47
Med Truck	49	11	5	60	13	7
Hvy Truck	33	5	11	40	7	13
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		
5th Street						
Segment East of:	Waterman Avenue					
Auto	272	45	32	313	52	36
Med Truck	41	9	5	47	10	5
Hvy Truck	27	5	9	31	5	10
Buses	2	2		3	3	
Mcycle	2			3		
Auxiliary	2			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Waterman Avenue						
Segment North of:	5th Street					
Auto	778	130	91	770	128	90
Med Truck	117	26	13	116	26	13
Hvy Truck	78	13	26	77	13	26
Buses	6	6		6	6	
Mcycle	6			6		
Auxiliary	6			6		
Waterman Avenue						
Segment South of:	5th Street					
Auto	834	139	97	793	132	93
Med Truck	125	28	14	119	26	13
Hvy Truck	83	14	28	79	13	26
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
5th Street						
Segment West of:	Waterman Avenue					
Auto	350	58	41	426	71	50
Med Truck	52	12	6	64	14	7
Hvy Truck	35	6	12	43	7	14
Buses	3	3		4	4	
Mcycle	3			4		
Auxiliary	3			4		
5th Street						
Segment East of:	Waterman Avenue					
Auto	289	48	34	332	55	39
Med Truck	43	10	5	50	11	6
Hvy Truck	29	5	10	33	6	11
Buses	2	2		3	3	
Mcycle	2			3		
Auxiliary	2			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	5th Street					
Auto	804	134	94	792	132	92
Med Truck	121	27	13	119	26	13
Hvy Truck	80	13	27	79	13	26
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Waterman Avenue						
Segment South of:	5th Street					
Auto	860	143	100	815	136	95
Med Truck	129	29	14	122	27	14
Hvy Truck	86	14	29	81	14	27
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
5th Street						
Segment West of:	Waterman Avenue					
Auto	350	58	41	426	71	50
Med Truck	52	12	6	64	14	7
Hvy Truck	35	6	12	43	7	14
Buses	3	3		4	4	
Mcycle	3			4		
Auxiliary	3			4		
5th Street						
Segment East of:	Waterman Avenue					
Auto	289	48	34	332	55	39
Med Truck	43	10	5	50	11	6
Hvy Truck	29	5	10	33	6	11
Buses	2	2		3	3	
Mcycle	2			3		
Auxiliary	2			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Waterman Avenue						
Segment North of:	5th Street					
Auto	1,343	224	157	1,326	221	155
Med Truck	201	45	22	199	44	22
Hvy Truck	134	22	45	133	22	44
Buses	11	11		11	11	
Mcycle	11			11		
Auxiliary	11			11		
Waterman Avenue						
Segment South of:	5th Street					
Auto	1,434	239	167	1,364	227	159
Med Truck	215	48	24	205	45	23
Hvy Truck	143	24	48	136	23	45
Buses	12	12		11	11	
Mcycle	12			11		
Auxiliary	12			11		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
5th Street						
Segment West of:	Waterman Avenue					
Auto	578	96	67	703	117	82
Med Truck	87	19	10	105	23	12
Hvy Truck	58	10	19	70	12	23
Buses	5	5		6	6	
Mcycle	5			6		
Auxiliary	5			6		
5th Street						
Segment East of:	Waterman Avenue					
Auto	476	79	56	548	91	64
Med Truck	71	16	8	82	18	9
Hvy Truck	48	8	16	55	9	18
Buses	4	4		5	5	
Mcycle	4			5		
Auxiliary	4			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Waterman Avenue						
Segment North of:	5th Street					
Auto	1,368	228	160	1,348	225	157
Med Truck	205	46	23	202	45	22
Hvy Truck	137	23	46	135	22	45
Buses	11	11		11	11	
Mcycle	11			11		
Auxiliary	11			11		
Waterman Avenue						
Segment South of:	5th Street					
Auto	1,460	243	170	1,386	231	162
Med Truck	219	49	24	208	46	23
Hvy Truck	146	24	49	139	23	46
Buses	12	12		12	12	
Mcycle	12			12		
Auxiliary	12			12		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
5th Street						
Segment West of:	Waterman Avenue					
Auto	578	96	67	703	117	82
Med Truck	87	19	10	105	23	12
Hvy Truck	58	10	19	70	12	23
Buses	5	5		6	6	
Mcycle	5			6		
Auxiliary	5			6		
5th Street						
Segment East of:	Waterman Avenue					
Auto	476	79	56	548	91	64
Med Truck	71	16	8	82	18	9
Hvy Truck	48	8	16	55	9	18
Buses	4	4		5	5	
Mcycle	4			5		
Auxiliary	4			5		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 7
N/S Street: Crestview Avenue
E/W Street: Base Line Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Crestview Avenue

Southbound

Scenario	right <	through v	left >
Existing	57	9	71
2013 Without Project	61	9	75
2013 With Project	61	9	75
2030 Without Project	100	16	124
2030 With Project	100	16	124

Base Line Street

Eastbound

Scenario	left ^	through >	right v
Existing	79	1,047	22
2013 Without Project	84	1,111	24
2013 With Project	84	1,119	37
2030 Without Project	138	1,881	39
2030 With Project	138	1,889	52

Westbound

Scenario	right ^	through <	left v
Existing	37	1,114	22
2013 Without Project	39	1,182	23
2013 With Project	39	1,187	29
2030 Without Project	65	1,998	38
2030 With Project	65	2,003	44

Northbound

Scenario	left <	through ^	right >
Existing	12	7	25
2013 Without Project	13	7	26
2013 With Project	29	7	34
2030 Without Project	21	12	44
2030 With Project	37	12	52

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Crestview Avenue

Segment North of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	1,142	1,025
2013 Without Project	1,208	1,083
2013 With Project	1,208	1,083
2030 Without Project	2,000	1,792
2030 With Project	2,000	1,792

Base Line Street

Segment West of: Crestview Avenue

Scenario	Traveling Direction WB	EB
Existing	9,858	9,567
2013 Without Project	10,467	10,158
2013 With Project	10,642	10,333
2030 Without Project	17,658	17,150
2030 With Project	17,833	17,325

Segment East of: Crestview Avenue

Scenario	Traveling Direction WB	EB
Existing	9,775	9,525
2013 Without Project	10,367	10,100
2013 With Project	10,458	10,233
2030 Without Project	17,508	17,075
2030 With Project	17,600	17,208

500

Segment South of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	442	367
2013 Without Project	467	383
2013 With Project	625	583
2030 Without Project	775	642
2030 With Project	933	842

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Crestview Avenue						
Segment North of:	Base Line Street					
Auto	57	10	7	51	9	6
Med Truck	9	2	1	8	2	1
Hvy Truck	6	1	2	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Crestview Avenue						
Segment South of:	Base Line Street					
Auto	22	4	3	18	3	2
Med Truck	3	1	0	3	1	0
Hvy Truck	2	0	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Crestview Avenue					
Auto	493	82	58	478	80	56
Med Truck	74	16	8	72	16	8
Hvy Truck	49	8	16	48	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Crestview Avenue					
Auto	489	81	57	476	79	56
Med Truck	73	16	8	71	16	8
Hvy Truck	49	8	16	48	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Crestview Avenue						
Segment North of:	Base Line Street					
Auto	60	10	7	54	9	6
Med Truck	9	2	1	8	2	1
Hvy Truck	6	1	2	5	1	2
Buses	1	1		0	0	
Mcycle	1			0		
Auxiliary	1			0		
Crestview Avenue						
Segment South of:	Base Line Street					
Auto	23	4	3	19	3	2
Med Truck	4	1	0	3	1	0
Hvy Truck	2	0	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Crestview Avenue					
Auto	523	87	61	508	85	59
Med Truck	79	17	9	76	17	8
Hvy Truck	52	9	17	51	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Crestview Avenue					
Auto	518	86	60	505	84	59
Med Truck	78	17	9	76	17	8
Hvy Truck	52	9	17	51	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Crestview Avenue						
Segment North of:	Base Line Street					
Auto	60	10	7	54	9	6
Med Truck	9	2	1	8	2	1
Hvy Truck	6	1	2	5	1	2
Buses	1	1		0	0	
Mcycle	1			0		
Auxiliary	1			0		
Crestview Avenue						
Segment South of:	Base Line Street					
Auto	31	5	4	29	5	3
Med Truck	5	1	1	4	1	0
Hvy Truck	3	1	1	3	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Crestview Avenue					
Auto	532	89	62	517	86	60
Med Truck	80	18	9	78	17	9
Hvy Truck	53	9	18	52	9	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Crestview Avenue					
Auto	523	87	61	512	85	60
Med Truck	78	17	9	77	17	9
Hvy Truck	52	9	17	51	9	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030 No Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Crestview Avenue						
Segment North of:	Base Line Street					
Auto	100	17	12	90	15	10
Med Truck	15	3	2	13	3	1
Hvy Truck	10	2	3	9	1	3
Buses	1	1		1	1	
Mcycle	1			1		
Auxiliary	1			1		
Crestview Avenue						
Segment South of:	Base Line Street					
Auto	39	6	5	32	5	4
Med Truck	6	1	1	5	1	1
Hvy Truck	4	1	1	3	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 No Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Crestview Avenue					
Auto	883	147	103	858	143	100
Med Truck	132	29	15	129	29	14
Hvy Truck	88	15	29	86	14	29
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Base Line Street						
Segment East of:	Crestview Avenue					
Auto	875	146	102	854	142	100
Med Truck	131	29	15	128	28	14
Hvy Truck	88	15	29	85	14	28
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Crestview Avenue						
Segment North of:	Base Line Street					
Auto	100	17	12	90	15	10
Med Truck	15	3	2	13	3	1
Hvy Truck	10	2	3	9	1	3
Buses	1	1		1	1	
Mcycle	1			1		
Auxiliary	1			1		
Crestview Avenue						
Segment South of:	Base Line Street					
Auto	47	8	5	42	7	5
Med Truck	7	2	1	6	1	1
Hvy Truck	5	1	2	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Crestview Avenue					
Auto	892	149	104	866	144	101
Med Truck	134	30	15	130	29	14
Hvy Truck	89	15	30	87	14	29
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Base Line Street						
Segment East of:	Crestview Avenue					
Auto	880	147	103	860	143	100
Med Truck	132	29	15	129	29	14
Hvy Truck	88	15	29	86	14	29
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 8
N/S Street: La Junita Street
E/W Street: Base Line Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

La Junita Street

Southbound

Scenario	right <	through v	left >
Existing			
2013 Without Project			
2013 With Project			
2030 Without Project			
2030 With Project			

Eastbound

Scenario	left ^	through >	right v
Existing		1,105	29
2013 Without Project		1,173	31
2013 With Project		1,189	31
2030 Without Project		1,983	51
2030 With Project		1,999	51

Westbound

Scenario	right ^	through <	left v
Existing		1,192	28
2013 Without Project		1,265	30
2013 With Project		1,276	40
2030 Without Project		2,134	49
2030 With Project		2,145	59

Northbound

Scenario	left <	through ^	right >
Existing	26		30
2013 Without Project	28		32
2013 With Project	28		44
2030 Without Project	46		53
2030 With Project	46		65

Base Line Street

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

La Junita Street

Segment North of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing		
2013 Without Project		
2013 With Project		
2030 Without Project		
2030 With Project		

Segment West of: La Junita Street

Scenario	Traveling Direction WB	EB
Existing	10,150	9,450
2013 Without Project	10,775	10,033
2013 With Project	10,867	10,167
2030 Without Project	18,167	16,950
2030 With Project	18,258	17,083

Segment East of: La Junita Street

Scenario	Traveling Direction WB	EB
Existing	10,167	9,458
2013 Without Project	10,792	10,042
2013 With Project	10,967	10,275
2030 Without Project	18,192	16,967
2030 With Project	18,367	17,200

Base Line Street

500

Segment South of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	475	467
2013 Without Project	508	500
2013 With Project	592	600
2030 Without Project	833	825
2030 With Project	917	925

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
La Junita Street						
Segment North of:	Base Line Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						
La Junita Street						
Segment South of:	Base Line Street					
Auto	24	4	3	23	4	3
Med Truck	4	1	0	4	1	0
Hvy Truck	2	0	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	La Junita Street					
Auto	508	85	59	473	79	55
Med Truck	76	17	8	71	16	8
Hvy Truck	51	8	17	47	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	La Junita Street					
Auto	508	85	59	473	79	55
Med Truck	76	17	8	71	16	8
Hvy Truck	51	8	17	47	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
La Junita Street						
Segment North of:	Base Line Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						
La Junita Street						
Segment South of:	Base Line Street					
Auto	25	4	3	25	4	3
Med Truck	4	1	0	4	1	0
Hvy Truck	3	0	1	3	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	La Junita Street					
Auto	539	90	63	502	84	59
Med Truck	81	18	9	75	17	8
Hvy Truck	54	9	18	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	La Junita Street					
Auto	540	90	63	502	84	59
Med Truck	81	18	9	75	17	8
Hvy Truck	54	9	18	50	8	17
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
La Junita Street						
Segment North of:	Base Line Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						
La Junita Street						
Segment South of:	Base Line Street					
Auto	30	5	3	30	5	4
Med Truck	4	1	0	5	1	1
Hvy Truck	3	0	1	3	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	La Junita Street					
Auto	543	91	63	508	85	59
Med Truck	82	18	9	76	17	8
Hvy Truck	54	9	18	51	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Base Line Street						
Segment East of:	La Junita Street					
Auto	548	91	64	514	86	60
Med Truck	82	18	9	77	17	9
Hvy Truck	55	9	18	51	9	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
La Junita Street						
Segment North of:	Base Line Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						
La Junita Street						
Segment South of:	Base Line Street					
Auto	42	7	5	41	7	5
Med Truck	6	1	1	6	1	1
Hvy Truck	4	1	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Base Line Street						
Segment West of:	La Junita Street					
Auto	908	151	106	848	141	99
Med Truck	136	30	15	127	28	14
Hvy Truck	91	15	30	85	14	28
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		
Base Line Street						
Segment East of:	La Junita Street					
Auto	910	152	106	848	141	99
Med Truck	136	30	15	127	28	14
Hvy Truck	91	15	30	85	14	28
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
La Junita Street						
Segment North of:	Base Line Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						
La Junita Street						
Segment South of:	Base Line Street					
Auto	46	8	5	46	8	5
Med Truck	7	2	1	7	2	1
Hvy Truck	5	1	2	5	1	2
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	La Junita Street					
Auto	913	152	107	854	142	100
Med Truck	137	30	15	128	28	14
Hvy Truck	91	15	30	85	14	28
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		
Base Line Street						
Segment East of:	La Junita Street					
Auto	918	153	107	860	143	100
Med Truck	138	31	15	129	29	14
Hvy Truck	92	15	31	86	14	29
Buses	8	8		7	7	
Mcycle	8			7		
Auxiliary	8			7		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 9
N/S Street: La Junita Street
E/W Street: Orange St/Driveway
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

La Junita Street

Southbound

Scenario	right <	through v	left >
Existing	5	47	
2013 Without Project	5	50	
2013 With Project	15	50	
2030 Without Project	9	83	
2030 With Project	19	83	

Orange St/Driveway

Eastbound

Scenario	left ^	through >	right v
Existing	7		37
2013 Without Project	7		40
2013 With Project	19		47
2030 Without Project	12		65
2030 With Project	24		72

Westbound

Scenario	right ^	through <	left v
Existing			
2013 Without Project			
2013 With Project			
2030 Without Project			
2030 With Project			

Northbound

Scenario	left <	through ^	right >
Existing	28	46	
2013 Without Project	30	48	
2013 With Project	36	48	
2030 Without Project	50	81	
2030 With Project	56	81	

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

La Junita Street

Segment North of: Orange St/Driveway

Scenario	Traveling Direction SB	NB
Existing	433	442
2013 Without Project	458	458
2013 With Project	542	558
2030 Without Project	767	775
2030 With Project	850	875

Orange St/Driveway

Segment West of: La Junita Street

Scenario	Traveling Direction WB	EB
Existing	275	367
2013 Without Project	292	392
2013 With Project	425	550
2030 Without Project	492	642
2030 With Project	625	800

Segment East of: La Junita Street

Scenario	Traveling Direction WB	EB
Existing		
2013 Without Project		
2013 With Project		
2030 Without Project		
2030 With Project		

500

Segment South of: Orange St/Driveway

Scenario	Traveling Direction SB	NB
Existing	700	617
2013 Without Project	750	650
2013 With Project	808	700
2030 Without Project	1,233	1,092
2030 With Project	1,292	1,142

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
La Junita Street						
Segment North of:	Orange St/Driveway					
Auto	22	4	3	22	4	3
Med Truck	3	1	0	3	1	0
Hvy Truck	2	0	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
La Junita Street						
Segment South of:	Orange St/Driveway					
Auto	35	6	4	31	5	4
Med Truck	5	1	1	5	1	1
Hvy Truck	4	1	1	3	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Orange St/Driveway						
Segment West of:	La Junita Street					
Auto	14	2	2	18	3	2
Med Truck	2	0	0	3	1	0
Hvy Truck	1	0	0	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Orange St/Driveway						
Segment East of:	La Junita Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
La Junita Street						
Segment North of:	Orange St/Driveway					
Auto	23	4	3	23	4	3
Med Truck	3	1	0	3	1	0
Hvy Truck	2	0	1	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
La Junita Street						
Segment South of:	Orange St/Driveway					
Auto	38	6	4	33	5	4
Med Truck	6	1	1	5	1	1
Hvy Truck	4	1	1	3	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Orange St/Driveway						
Segment West of:	La Junita Street					
Auto	15	2	2	20	3	2
Med Truck	2	0	0	3	1	0
Hvy Truck	1	0	0	2	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Orange St/Driveway						
Segment East of:	La Junita Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
La Junita Street						
Segment North of:	Orange St/Driveway					
Auto	27	5	3	28	5	3
Med Truck	4	1	0	4	1	0
Hvy Truck	3	0	1	3	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
La Junita Street						
Segment South of:	Orange St/Driveway					
Auto	40	7	5	35	6	4
Med Truck	6	1	1	5	1	1
Hvy Truck	4	1	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Orange St/Driveway						
Segment West of:	La Junita Street					
Auto	21	4	2	28	5	3
Med Truck	3	1	0	4	1	0
Hvy Truck	2	0	1	3	0	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Orange St/Driveway						
Segment East of:	La Junita Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
La Junita Street						
Segment North of:	Orange St/Driveway					
Auto	38	6	4	39	6	5
Med Truck	6	1	1	6	1	1
Hvy Truck	4	1	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
La Junita Street						
Segment South of:	Orange St/Driveway					
Auto	62	10	7	55	9	6
Med Truck	9	2	1	8	2	1
Hvy Truck	6	1	2	5	1	2
Buses	1	1		0	0	
Mcycle	1			0		
Auxiliary	1			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Orange St/Driveway						
Segment West of:	La Junita Street					
Auto	25	4	3	32	5	4
Med Truck	4	1	0	5	1	1
Hvy Truck	2	0	1	3	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Orange St/Driveway						
Segment East of:	La Junita Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
La Junita Street						
Segment North of:	Orange St/Driveway					
Auto	43	7	5	44	7	5
Med Truck	6	1	1	7	1	1
Hvy Truck	4	1	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
La Junita Street						
Segment South of:	Orange St/Driveway					
Auto	65	11	8	57	10	7
Med Truck	10	2	1	9	2	1
Hvy Truck	6	1	2	6	1	2
Buses	1	1		0	0	
Mcycle	1			0		
Auxiliary	1			0		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Orange St/Driveway						
Segment West of:	La Junita Street					
Auto	31	5	4	40	7	5
Med Truck	5	1	1	6	1	1
Hvy Truck	3	1	1	4	1	1
Buses	0	0		0	0	
Mcycle	0			0		
Auxiliary	0			0		
Orange St/Driveway						
Segment East of:	La Junita Street					
Auto						
Med Truck						
Hvy Truck						
Buses						
Mcycle						
Auxiliary						

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens Housing Project
Traffic Calculations

Intersection ID: 10
N/S Street: Del Rosa Drive
E/W Street: Base Line Street
Source: Fehr & Peers, Draft Waterman Gardens Master Plan Traffic Impact Analysis, (2011).

Intersection Diagram: Peak A.M. + Peak P.M. Traffic Volumes

Del Rosa Drive

Southbound

Scenario	right <	through v	left >
Existing	238	562	86
2013 Without Project	253	596	91
2013 With Project	257	596	91
2030 Without Project	417	999	150
2030 With Project	421	999	150

Eastbound

Scenario	left ^	through >	right v
Existing	189	764	126
2013 Without Project	200	811	134
2013 With Project	205	827	141
2030 Without Project	332	1,378	227
2030 With Project	337	1,394	234

Westbound

Scenario	right ^	through <	left v
Existing	67	820	88
2013 Without Project	71	870	94
2013 With Project	71	882	94
2030 Without Project	117	1,482	154
2030 With Project	117	1,494	154

Northbound

Scenario	left <	through ^	right >
Existing	74	432	68
2013 Without Project	78	459	72
2013 With Project	83	459	72
2030 Without Project	135	768	119
2030 With Project	140	768	119

Base Line Street

Average Daily Trip Distribution Diagram: (Peak A.M. + Peak P.M.) / 12%

Del Rosa Drive

Segment North of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	7,383	5,733
2013 Without Project	7,833	6,083
2013 With Project	7,867	6,125
2030 Without Project	13,050	10,142
2030 With Project	13,083	10,183

Segment West of: Del Rosa Drive

Scenario	Traveling Direction WB	EB
Existing	9,433	8,992
2013 Without Project	10,008	9,542
2013 With Project	10,183	9,775
2030 Without Project	16,950	16,142
2030 With Project	17,125	16,375

Segment East of: Del Rosa Drive

Scenario	Traveling Direction WB	EB
Existing	8,125	7,650
2013 Without Project	8,625	8,117
2013 With Project	8,725	8,250
2030 Without Project	14,608	13,725
2030 With Project	14,708	13,858

Base Line Street

500

Segment South of: Base Line Street

Scenario	Traveling Direction SB	NB
Existing	6,467	4,783
2013 Without Project	6,867	5,075
2013 With Project	6,925	5,117
2030 Without Project	11,500	8,517
2030 With Project	11,558	8,558

Vehicles per Hour, Existing

Existing	Southbound			Northbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Del Rosa Drive						
Segment North of:	Base Line Street					
Auto	369	62	43	287	48	33
Med Truck	55	12	6	43	10	5
Hvy Truck	37	6	12	29	5	10
Buses	3	3		2	2	
Mcycle	3			2		
Auxiliary	3			2		
Del Rosa Drive						
Segment South of:	Base Line Street					
Auto	323	54	38	239	40	28
Med Truck	49	11	5	36	8	4
Hvy Truck	32	5	11	24	4	8
Buses	3	3		2	2	
Mcycle	3			2		
Auxiliary	3			2		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Existing	Westbound			Eastbound		
	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Del Rosa Drive					
Auto	472	79	55	450	75	52
Med Truck	71	16	8	67	15	7
Hvy Truck	47	8	16	45	7	15
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Del Rosa Drive					
Auto	406	68	47	383	64	45
Med Truck	61	14	7	57	13	6
Hvy Truck	41	7	14	38	6	13
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, No Project

Year 2013	Southbound			Northbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Del Rosa Drive						
Segment North of:	Base Line Street					
Auto	392	65	46	304	51	35
Med Truck	59	13	7	46	10	5
Hvy Truck	39	7	13	30	5	10
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		
Del Rosa Drive						
Segment South of:	Base Line Street					
Auto	343	57	40	254	42	30
Med Truck	52	11	6	38	8	4
Hvy Truck	34	6	11	25	4	8
Buses	3	3		2	2	
Mcycle	3			2		
Auxiliary	3			2		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013	Westbound			Eastbound		
No Project	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr	Daytime Veh/hr	Evening Veh/hr	Night Veh/hr
Base Line Street						
Segment West of:	Del Rosa Drive					
Auto	500	83	58	477	80	56
Med Truck	75	17	8	72	16	8
Hvy Truck	50	8	17	48	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Del Rosa Drive					
Auto	431	72	50	406	68	47
Med Truck	65	14	7	61	14	7
Hvy Truck	43	7	14	41	7	14
Buses	4	4		3	3	
Mcycle	4			3		
Auxiliary	4			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2013, With Project

Year 2013 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Del Rosa Drive						
Segment North of:	Base Line Street					
Auto	393	66	46	306	51	36
Med Truck	59	13	7	46	10	5
Hvy Truck	39	7	13	31	5	10
Buses	3	3		3	3	
Mcycle	3			3		
Auxiliary	3			3		
Del Rosa Drive						
Segment South of:	Base Line Street					
Auto	346	58	40	256	43	30
Med Truck	52	12	6	38	9	4
Hvy Truck	35	6	12	26	4	9
Buses	3	3		2	2	
Mcycle	3			2		
Auxiliary	3			2		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2013 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Del Rosa Drive					
Auto	509	85	59	489	81	57
Med Truck	76	17	8	73	16	8
Hvy Truck	51	8	17	49	8	16
Buses	4	4		4	4	
Mcycle	4			4		
Auxiliary	4			4		
Base Line Street						
Segment East of:	Del Rosa Drive					
Auto	436	73	51	413	69	48
Med Truck	65	15	7	62	14	7
Hvy Truck	44	7	15	41	7	14
Buses	4	4		3	3	
Mcycle	4			3		
Auxiliary	4			3		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, No Project

Year 2030	Southbound			Northbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Del Rosa Drive						
Segment North of:	Base Line Street					
Auto	653	109	76	507	85	59
Med Truck	98	22	11	76	17	8
Hvy Truck	65	11	22	51	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Del Rosa Drive						
Segment South of:	Base Line Street					
Auto	575	96	67	426	71	50
Med Truck	86	19	10	64	14	7
Hvy Truck	58	10	19	43	7	14
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030	Westbound			Eastbound		
No Project	Daytime	Evening	Night	Daytime	Evening	Night
	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr	Veh/hr
Base Line Street						
Segment West of:	Del Rosa Drive					
Auto	848	141	99	807	135	94
Med Truck	127	28	14	121	27	13
Hvy Truck	85	14	28	81	13	27
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Base Line Street						
Segment East of:	Del Rosa Drive					
Auto	730	122	85	686	114	80
Med Truck	110	24	12	103	23	11
Hvy Truck	73	12	24	69	11	23
Buses	6	6		6	6	
Mcycle	6			6		
Auxiliary	6			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Vehicles per Hour, Year 2030, With Project

Year 2030 With Project	Southbound Daytime Veh/hr	Southbound Evening Veh/hr	Southbound Night Veh/hr	Northbound Daytime Veh/hr	Northbound Evening Veh/hr	Northbound Night Veh/hr
Del Rosa Drive						
Segment North of:	Base Line Street					
Auto	654	109	76	509	85	59
Med Truck	98	22	11	76	17	8
Hvy Truck	65	11	22	51	8	17
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		
Del Rosa Drive						
Segment South of:	Base Line Street					
Auto	578	96	67	428	71	50
Med Truck	87	19	10	64	14	7
Hvy Truck	58	10	19	43	7	14
Buses	5	5		4	4	
Mcycle	5			4		
Auxiliary	5			4		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Year 2030 With Project	Westbound Daytime Veh/hr	Westbound Evening Veh/hr	Westbound Night Veh/hr	Eastbound Daytime Veh/hr	Eastbound Evening Veh/hr	Eastbound Night Veh/hr
Base Line Street						
Segment West of:	Del Rosa Drive					
Auto	856	143	100	819	136	96
Med Truck	128	29	14	123	27	14
Hvy Truck	86	14	29	82	14	27
Buses	7	7		7	7	
Mcycle	7			7		
Auxiliary	7			7		
Base Line Street						
Segment East of:	Del Rosa Drive					
Auto	735	123	86	693	115	81
Med Truck	110	25	12	104	23	12
Hvy Truck	74	12	25	69	12	23
Buses	6	6		6	6	
Mcycle	6			6		
Auxiliary	6			6		

Percentage Assumptions:

Vehicle	Daytime	Evening	Night
Auto	60.0%	10.0%	7.0%
Med Truck	9.0%	2.0%	1.0%
Hvy Truck	6.0%	1.0%	2.0%
Buses	0.5%	0.5%	
Mcycle	0.5%		
Auxiliary	0.5%		

Estimated from EMFAC2007.

Waterman Gardens
Assessed receiver levels - Existing

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
1	01House	GR	S	70.1	69.2	61.99	
2	02House	GR	S	69.9	69.0	61.81	
5	03House	GR	W	56.1	54.9	47.63	
6	04House	GR	N	53.7	52.5	45.19	
8	05House	GR	E	63.3	62.1	54.91	
9	06House	GR	E	62.3	61.1	53.93	
10	07House	GR	E	61.6	60.3	53.19	
11	08House	GR	E	58.2	56.9	49.78	
12	09House	GR	E	61.7	60.4	53.29	
13	10House	GR	E	61.7	60.4	53.27	
14	11House	GR	E	61.5	60.2	53.04	
15	12House	GR	E	61.4	60.1	52.97	
16	13House	GR	E	61.1	59.8	52.64	
17	14House	GR	E	61.4	60.1	52.96	
18	15House	GR	E	61.4	60.1	52.97	
19	16House	GR	E	60.5	59.2	52.08	
20	17House	GR	E	61.1	59.8	52.69	
21	18House	GR	E	60.8	59.5	52.42	
27	19School	SCH	W	60.7	59.4	52.31	
26	20School	SCH	W	59.9	58.6	51.53	
25	21School	SCH	W	59.5	58.1	51.03	
24	22School	SCH	W	59.3	57.9	50.87	
23	23School	SCH	W	59.0	57.6	50.54	
22	24School	SCH	W	58.6	57.2	50.18	
28	25House	GR	S	69.7	68.7	61.53	
29	26House	GR	S	70.3	69.3	62.12	
30	27House	GR	S	69.5	68.5	61.30	
31	28House	GR	S	69.2	68.3	61.09	
36	29House	GR	N	67.0	66.0	58.82	
32	30House	GR	S	71.4	70.4	63.27	
34	31House	GR	N	69.4	68.4	61.24	
35	32House	GR	N	67.9	66.8	59.70	
33	33House	GR	N	69.1	68.2	61.01	
37	34MHome	GR	W	52.7	51.7	44.00	

Waterman Gardens
Assessed receiver levels - Existing

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
38	35MHome	GR	SW	57.0	56.2	48.14	
39	36MHome	GR	NE	57.3	56.4	48.82	
40	37MHome	GR	NE	55.2	54.3	46.50	
41	38MHome	GR	NW	55.2	54.3	46.53	
42	39MHome	GR	NW	55.7	54.8	47.17	
43	40Church	MIX	N	56.5	55.5	47.97	
44	41House	GR	E	64.9	63.8	56.62	
45	42House	GR	E	73.9	72.9	65.71	
46	43House	GR	N	65.0	64.0	56.78	
47	44House	GR	S	56.5	55.1	47.79	
48	45House	GR	N	61.5	60.6	52.91	
50	46House	GR	N	60.9	60.0	52.23	
49	47House	GR	S	65.5	64.4	57.07	
51	48House	GR	S	62.9	61.9	54.28	
63	49House	GR	E	65.1	64.0	56.81	
64	50House	GR	E	65.8	64.7	57.51	
66	51Church	MIX	E	73.6	72.6	65.44	
67	52House	GR	S	65.0	63.8	56.58	
65	53House	GR	S	63.1	61.9	54.57	
53	54House	GR	S	60.0	59.0	51.00	
55	55House	GR	S	58.8	57.9	49.63	
57	56House	GR	S	57.9	57.0	48.56	
59	57House	GR	S	56.8	55.9	47.37	
62	58House	GR	S	58.1	57.3	48.44	
61	59House	GR	N	55.1	54.8	45.50	
60	60House	GR	N	55.6	55.2	45.98	
58	61House	GR	N	56.1	55.6	46.63	
56	62House	GR	N	56.7	56.2	47.44	
54	63House	GR	N	58.0	57.3	48.99	
52	64House	GR	N	59.5	58.6	50.73	
3	65House	GR	E	61.8	60.6	53.37	
68	66House	GR	N	72.4	71.4	64.33	
7	67House	GR	S	70.0	69.1	61.88	

Waterman Gardens
Assessed receiver levels - Future No Project

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Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
1	01House	GR	S	70.4	69.4	62.26	
2	02House	GR	S	70.2	69.2	62.07	
5	03House	GR	W	56.3	55.1	47.95	
6	04House	GR	N	54.0	52.7	45.51	
8	05House	GR	E	63.5	62.3	55.31	
9	06House	GR	E	62.5	61.3	54.37	
10	07House	GR	E	61.8	60.6	53.66	
11	08House	GR	E	58.4	57.1	50.19	
12	09House	GR	E	61.9	60.7	53.78	
13	10House	GR	E	61.8	60.6	53.77	
14	11House	GR	E	61.6	60.4	53.55	
15	12House	GR	E	61.5	60.4	53.49	
16	13House	GR	E	61.2	60.0	53.17	
17	14House	GR	E	61.5	60.3	53.49	
18	15House	GR	E	61.5	60.3	53.50	
19	16House	GR	E	60.7	59.5	52.62	
20	17House	GR	E	61.2	60.1	53.22	
21	18House	GR	E	61.0	59.8	52.95	
27	19School	SCH	W	60.8	59.6	52.67	
26	20School	SCH	W	60.0	58.8	51.89	
25	21School	SCH	W	59.6	58.3	51.41	
24	22School	SCH	W	59.4	58.1	51.24	
23	23School	SCH	W	59.1	57.8	50.91	
22	24School	SCH	W	58.7	57.4	50.53	
28	25House	GR	S	69.9	69.0	61.78	
29	26House	GR	S	70.5	69.5	62.37	
30	27House	GR	S	69.7	68.7	61.56	
31	28House	GR	S	69.5	68.5	61.35	
36	29House	GR	N	67.2	66.2	59.04	
32	30House	GR	S	71.7	70.7	63.53	
34	31House	GR	N	69.6	68.6	61.46	
35	32House	GR	N	68.1	67.1	59.92	
33	33House	GR	N	69.4	68.4	61.23	
37	34MHome	GR	W	53.4	52.1	44.55	

Waterman Gardens
Assessed receiver levels - Future No Project

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
38	35MHome	GR	SW	57.7	56.5	48.72	
39	36MHome	GR	NE	58.2	56.9	49.61	
40	37MHome	GR	NE	56.0	54.7	47.17	
41	38MHome	GR	NW	56.0	54.7	47.21	
42	39MHome	GR	NW	56.6	55.3	47.94	
43	40Church	MIX	N	57.2	55.9	48.56	
44	41House	GR	E	65.2	64.1	56.90	
45	42House	GR	E	74.1	73.1	66.00	
46	43House	GR	N	65.2	64.2	57.06	
47	44House	GR	S	56.7	55.4	48.08	
48	45House	GR	N	61.7	60.8	53.16	
50	46House	GR	N	61.1	60.2	52.46	
49	47House	GR	S	65.7	64.7	57.34	
51	48House	GR	S	63.2	62.1	54.54	
63	49House	GR	E	65.4	64.3	57.11	
64	50House	GR	E	66.0	65.0	57.81	
66	51Church	MIX	E	73.9	72.8	65.75	
67	52House	GR	S	65.2	64.1	56.88	
65	53House	GR	S	63.4	62.1	54.87	
53	54House	GR	S	60.2	59.1	51.21	
55	55House	GR	S	59.0	58.0	49.80	
57	56House	GR	S	58.1	57.1	48.71	
59	57House	GR	S	57.0	56.0	47.50	
62	58House	GR	S	58.2	57.3	48.51	
61	59House	GR	N	55.4	54.9	45.61	
60	60House	GR	N	55.8	55.2	46.11	
58	61House	GR	N	56.3	55.7	46.77	
56	62House	GR	N	57.0	56.3	47.60	
54	63House	GR	N	58.3	57.4	49.19	
52	64House	GR	N	59.7	58.8	50.94	
3	65House	GR	E	62.1	60.9	53.68	
68	66House	GR	N	72.7	71.7	64.53	
7	67House	GR	S	70.3	69.3	62.14	

Waterman Gardens
Assessed receiver levels - Future with Project

Object	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
1	01House	GR	S	70.7	69.7	62.57	62.62	
2	02House	GR	S	70.5	69.5	62.39	62.45	
5	03House	GR	W	56.5	55.3	48.07	48.59	
6	04House	GR	N	54.1	52.9	45.61	46.28	
8	05House	GR	E	63.8	62.7	55.66	55.85	
9	06House	GR	E	62.8	61.6	54.66	54.85	
10	07House	GR	E	62.0	60.8	53.86	54.04	
11	08House	GR	E	58.4	57.2	50.26	50.58	
12	09House	GR	E	62.0	60.8	53.89	54.03	
13	10House	GR	E	61.9	60.7	53.83	53.97	
14	11House	GR	E	61.7	60.5	53.62	53.75	
15	12House	GR	E	61.6	60.4	53.54	53.66	
16	13House	GR	E	61.3	60.1	53.21	53.33	
17	14House	GR	E	61.6	60.4	53.53	53.63	
18	15House	GR	E	61.6	60.4	53.53	53.63	
19	16House	GR	E	60.7	59.5	52.64	52.75	
20	17House	GR	E	61.3	60.1	53.23	53.33	
21	18House	GR	E	61.0	59.8	52.96	53.05	
27	19School	SCH	W	61.0	59.7	52.79	53.11	
26	20School	SCH	W	60.1	58.8	51.92	52.23	
25	21School	SCH	W	59.6	58.3	51.46	51.78	
24	22School	SCH	W	59.4	58.1	51.27	51.59	
23	23School	SCH	W	59.1	57.8	50.93	51.25	
22	24School	SCH	W	58.7	57.4	50.56	50.88	
28	25House	GR	S	70.1	69.1	61.98	62.00	
29	26House	GR	S	70.6	69.7	62.54	62.55	
30	27House	GR	S	69.8	68.8	61.70	61.70	
31	28House	GR	S	69.6	68.6	61.49	61.48	
36	29House	GR	N	67.3	66.3	59.20	59.22	
32	30House	GR	S	71.8	70.8	63.66	63.67	
34	31House	GR	N	69.7	68.7	61.62	61.63	
35	32House	GR	N	68.2	67.2	60.08	60.13	
33	33House	GR	N	69.5	68.5	61.38	61.41	
37	34MHome	GR	W	53.6	52.2	45.35	45.76	

Waterman Gardens
Assessed receiver levels - Future with Project

Object	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
38	35MHome	GR	SW	58.4	57.2	50.36	50.47	
39	36MHome	GR	NE	58.7	57.4	50.55	50.86	
40	37MHome	GR	NE	56.5	55.2	48.34	48.68	
41	38MHome	GR	NW	56.5	55.1	48.31	48.65	
42	39MHome	GR	NW	57.1	55.8	48.94	49.28	
43	40Church	MIX	N	57.9	56.6	49.76	50.04	
44	41House	GR	E	65.3	64.2	57.03	57.38	
45	42House	GR	E	74.3	73.3	66.13	66.18	
46	43House	GR	N	65.4	64.4	57.19	57.36	
47	44House	GR	S	56.8	55.4	48.10	49.01	
48	45House	GR	N	61.8	60.8	53.20	53.71	
50	46House	GR	N	61.1	60.2	52.44	53.10	
49	47House	GR	S	65.8	64.8	57.46	57.81	
51	48House	GR	S	63.2	62.1	54.61	55.29	
63	49House	GR	E	65.5	64.4	57.18	57.55	
64	50House	GR	E	66.2	65.1	57.91	58.19	
66	51Church	MIX	E	74.0	73.0	65.87	65.94	
67	52House	GR	S	65.4	64.2	57.00	57.47	
65	53House	GR	S	63.6	62.3	55.01	55.80	
53	54House	GR	S	60.2	59.2	51.25	52.28	
55	55House	GR	S	58.9	58.0	49.72	50.97	
57	56House	GR	S	58.1	57.2	48.75	50.13	
59	57House	GR	S	57.0	56.1	47.53	49.05	
62	58House	GR	S	58.2	57.4	48.53	50.24	
61	59House	GR	N	55.4	54.9	45.65	47.12	
60	60House	GR	N	55.7	55.2	46.06	47.50	
58	61House	GR	N	56.3	55.7	46.82	48.14	
56	62House	GR	N	56.9	56.2	47.52	48.77	
54	63House	GR	N	58.3	57.5	49.25	50.27	
52	64House	GR	N	59.8	58.9	51.01	51.78	
3	65House	GR	E	62.2	61.0	53.79	54.36	
68	66House	GR	N	73.0	72.0	64.85	64.88	
7	67House	GR	S	70.7	69.7	62.58	62.65	
70	72Project	GR	N	69.3 70.3	68.3 69.4	61.10 62.20	61.24 62.29	

Waterman Gardens
Assessed receiver levels - Future with Project

Object	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)
69	73Project	GR	W	70.5	69.5	62.33	62.37
				70.9	69.9	62.73	62.76
71	74Project	GR	N	69.7	68.7	61.56	61.61
72	75Project	GR	N	69.6	68.6	61.51	61.55
75	76Project	GR	S	62.4	61.2	54.36	54.54
73	77Project	GR	E	59.6	58.5	51.67	51.53
74	78Project	GR	S	61.5	60.3	53.46	53.56
76	79Project	GR	N	69.2	68.2	60.99	61.10
				69.7	68.7	61.58	61.69
77	80Project	GR	N	69.3	68.3	61.19	61.29
				69.7	68.7	61.56	61.65
78	81Project	GR	N	69.2	68.2	61.09	61.18
79	82Project	GR	N	69.2	68.2	61.07	61.13
80	83Project	GR	N	69.3	68.3	61.15	61.19
81	84Project	GR	N	69.3	68.3	61.18	61.22
82	85Project	GR	N	69.3	68.3	61.16	61.21

Waterman Gardens
Assessed receiver levels - Cumulative No Project

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Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
1	01House	GR	S	72.0	71.0	63.84	
2	02House	GR	S	71.8	70.8	63.64	
5	03House	GR	W	58.7	57.5	50.24	
6	04House	GR	N	56.3	55.0	47.74	
8	05House	GR	E	65.2	64.2	57.08	
9	06House	GR	E	64.3	63.3	56.15	
10	07House	GR	E	63.6	62.6	55.49	
11	08House	GR	E	60.2	59.2	52.04	
12	09House	GR	E	63.8	62.8	55.72	
13	10House	GR	E	63.8	62.8	55.73	
14	11House	GR	E	63.6	62.6	55.51	
15	12House	GR	E	63.5	62.6	55.48	
16	13House	GR	E	63.2	62.2	55.15	
17	14House	GR	E	63.5	62.6	55.49	
18	15House	GR	E	63.6	62.6	55.51	
19	16House	GR	E	62.7	61.7	54.62	
20	17House	GR	E	63.3	62.3	55.23	
21	18House	GR	E	63.0	62.0	54.96	
27	19School	SCH	W	62.8	61.8	54.62	
26	20School	SCH	W	62.0	61.0	53.86	
25	21School	SCH	W	61.6	60.6	53.38	
24	22School	SCH	W	61.4	60.4	53.23	
23	23School	SCH	W	61.1	60.1	52.89	
22	24School	SCH	W	60.7	59.7	52.51	
28	25House	GR	S	71.5	70.5	63.38	
29	26House	GR	S	72.1	71.2	64.01	
30	27House	GR	S	71.2	70.3	63.13	
31	28House	GR	S	71.0	70.1	62.92	
36	29House	GR	N	68.2	67.2	60.08	
32	30House	GR	S	73.3	72.4	65.21	
34	31House	GR	N	70.7	69.7	62.54	
35	32House	GR	N	69.1	68.1	60.94	
33	33House	GR	N	70.5	69.5	62.32	
37	34MHome	GR	W	54.9	53.3	46.45	

Waterman Gardens
Assessed receiver levels - Cumulative No Project

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	
38	35MHome	GR	SW	59.4	57.9	51.19	
39	36MHome	GR	NE	59.3	57.7	51.03	
40	37MHome	GR	NE	57.3	55.8	49.03	
41	38MHome	GR	NW	57.3	55.7	48.97	
42	39MHome	GR	NW	57.7	56.1	49.43	
43	40Church	MIX	N	58.5	57.0	50.25	
44	41House	GR	E	67.5	66.4	59.24	
45	42House	GR	E	76.5	75.5	68.34	
46	43House	GR	N	67.6	66.6	59.40	
47	44House	GR	S	59.0	57.7	50.37	
48	45House	GR	N	63.9	62.9	55.67	
50	46House	GR	N	63.3	62.3	55.02	
49	47House	GR	S	68.0	66.9	59.79	
51	48House	GR	S	65.4	64.2	57.09	
63	49House	GR	E	67.7	66.6	59.44	
64	50House	GR	E	68.4	67.3	60.13	
66	51Church	MIX	E	76.2	75.2	68.05	
67	52House	GR	S	67.5	66.3	59.13	
65	53House	GR	S	65.6	64.3	57.04	
53	54House	GR	S	62.3	61.1	53.99	
55	55House	GR	S	61.0	59.9	52.76	
57	56House	GR	S	60.0	58.9	51.82	
59	57House	GR	S	58.9	57.8	50.73	
62	58House	GR	S	60.1	59.0	52.03	
61	59House	GR	N	57.0	56.3	48.66	
60	60House	GR	N	57.5	56.7	49.14	
58	61House	GR	N	58.1	57.2	49.71	
56	62House	GR	N	58.8	57.9	50.47	
54	63House	GR	N	60.3	59.3	51.92	
52	64House	GR	N	61.9	60.9	53.56	
3	65House	GR	E	64.4	63.2	55.96	
68	66House	GR	N	73.5	72.6	65.39	
7	67House	GR	S	71.9	70.9	63.73	

Waterman Gardens
Assessed receiver levels - Cumulative with Project

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Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
1	01House	GR	S	72.8	71.8	64.67	64.70	
2	02House	GR	S	72.6	71.6	64.49	64.53	
5	03House	GR	W	58.8	57.6	50.42	50.91	
6	04House	GR	N	56.4	55.2	47.95	48.59	
8	05House	GR	E	66.0	64.9	57.81	57.95	
9	06House	GR	E	65.0	63.9	56.81	56.92	
10	07House	GR	E	64.1	63.1	55.98	56.08	
11	08House	GR	E	60.4	59.4	52.22	52.43	
12	09House	GR	E	64.1	63.1	55.99	56.02	
13	10House	GR	E	64.0	63.0	55.93	55.95	
14	11House	GR	E	63.8	62.8	55.70	55.72	
15	12House	GR	E	63.7	62.7	55.62	55.61	
16	13House	GR	E	63.3	62.3	55.27	55.27	
17	14House	GR	E	63.6	62.7	55.59	55.57	
18	15House	GR	E	63.6	62.7	55.58	55.54	
19	16House	GR	E	62.7	61.8	54.68	54.66	
20	17House	GR	E	63.3	62.3	55.27	55.23	
21	18House	GR	E	63.0	62.1	55.00	54.96	
27	19School	SCH	W	62.9	62.0	54.75	54.90	
26	20School	SCH	W	62.0	61.0	53.83	53.96	
25	21School	SCH	W	61.6	60.6	53.38	53.53	
24	22School	SCH	W	61.4	60.4	53.21	53.35	
23	23School	SCH	W	61.1	60.1	52.88	53.01	
22	24School	SCH	W	60.8	59.8	52.57	52.68	
28	25House	GR	S	72.3	71.4	64.21	64.26	
29	26House	GR	S	72.9	71.9	64.77	64.83	
30	27House	GR	S	72.1	71.1	63.92	63.99	
31	28House	GR	S	71.8	70.9	63.71	63.76	
36	29House	GR	N	69.5	68.6	61.40	61.48	
32	30House	GR	S	74.0	73.0	65.89	65.96	
34	31House	GR	N	72.0	71.0	63.82	63.90	
35	32House	GR	N	70.4	69.4	62.27	62.40	
33	33House	GR	N	71.7	70.7	63.59	63.67	
37	34MHome	GR	W	55.5	54.2	47.02	47.74	

Waterman Gardens
Assessed receiver levels - Cumulative with Project

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
38	35MHome	GR	SW	60.3	59.0	51.94	52.41	
39	36MHome	GR	NE	60.6	59.4	52.23	52.68	
40	37MHome	GR	NE	58.4	57.1	49.97	50.57	
41	38MHome	GR	NW	58.4	57.1	49.94	50.53	
42	39MHome	GR	NW	59.0	57.7	50.59	51.11	
43	40Church	MIX	N	59.8	58.6	51.44	51.96	
44	41House	GR	E	67.6	66.5	59.33	59.68	
45	42House	GR	E	76.6	75.6	68.44	68.50	
46	43House	GR	N	67.7	66.7	59.49	59.67	
47	44House	GR	S	59.1	57.7	50.43	51.31	
48	45House	GR	N	64.3	63.1	55.97	56.35	
50	46House	GR	N	63.7	62.5	55.31	55.79	
49	47House	GR	S	68.2	67.1	59.96	60.20	
51	48House	GR	S	65.6	64.4	57.31	57.75	
63	49House	GR	E	67.8	66.7	59.53	59.88	
64	50House	GR	E	68.5	67.4	60.24	60.51	
66	51Church	MIX	E	76.4	75.4	68.23	68.32	
67	52House	GR	S	67.7	66.5	59.31	59.78	
65	53House	GR	S	65.9	64.6	57.30	58.08	
53	54House	GR	S	62.7	61.4	54.36	54.90	
55	55House	GR	S	61.5	60.2	53.18	53.73	
57	56House	GR	S	60.7	59.4	52.41	52.96	
59	57House	GR	S	59.6	58.2	51.33	51.88	
62	58House	GR	S	60.9	59.5	52.75	53.17	
61	59House	GR	N	58.6	57.2	50.02	50.83	
60	60House	GR	N	58.8	57.5	50.32	51.12	
58	61House	GR	N	59.3	58.0	50.81	51.58	
56	62House	GR	N	59.8	58.4	51.30	52.06	
54	63House	GR	N	61.0	59.7	52.58	53.26	
52	64House	GR	N	62.4	61.2	54.02	54.57	
3	65House	GR	E	64.5	63.3	56.14	56.67	
68	66House	GR	N	75.1	74.1	66.95	66.98	
7	67House	GR	S	72.9	71.9	64.79	64.88	
70	72Project	GR	N	71.5 72.6	70.5 71.6	63.34 64.44	63.43 64.49	

Waterman Gardens
Assessed receiver levels - Cumulative with Project

Object No.	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)
69	73Project	GR	W	72.8	71.8	64.67	64.73
				73.2	72.2	65.07	65.11
71	74Project	GR	N	71.9	70.9	63.76	63.84
72	75Project	GR	N	71.9	70.9	63.72	63.79
75	76Project	GR	S	64.3	63.1	56.03	56.48
73	77Project	GR	E	61.9	60.8	53.75	53.92
74	78Project	GR	S	63.4	62.1	55.07	55.47
76	79Project	GR	N	71.3	70.3	63.22	63.29
				71.9	70.9	63.82	63.89
77	80Project	GR	N	71.5	70.5	63.42	63.48
				71.9	70.9	63.79	63.85
78	81Project	GR	N	71.4	70.5	63.32	63.38
79	82Project	GR	N	71.4	70.4	63.27	63.36
80	83Project	GR	N	71.5	70.5	63.35	63.43
81	84Project	GR	N	71.5	70.5	63.38	63.46
82	85Project	GR	N	71.5	70.5	63.36	63.45

APPENDIX B

Construction Noise Calculations and Model Files

Waterman Gardens Master Plan Project
Noise Source Levels for Construction Equipment
Based on Federal Transit Administration, Office of Planning and Environment

Noise Attenuation: 6 dBA per doubling of distance
(acoustically "hard" site)

Demolition Phase Construction Equipment	Number of Units	Equipment Use Factor[1]	Lmax Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Lmax Noise Level @ Distance (dBA)	Without Noise Shielding Leq Noise Level @ Distance (dBA)	With Noise Shielding Lmax Noise Level @ Distance (dBA)	With Noise Shielding Leq Noise Level @ Distance (dBA)
All Other Equipment > 5 HP	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Auger Drill Rig	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Backhoe	**1**	**40%**	**80.0**	**100**	**0.0**	**74.0**	**70.0**	**74.0**	**70.0**
Bar Bender	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Blasting	0	1%	94.0	50	0.0	0.0	0.0	0.0	0.0
Boring Jack Power Unit	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Chain Saw	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Clam Shovel (dropping)	0	20%	93.0	50	0.0	0.0	0.0	0.0	0.0
Compactor (ground)	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Compressor (air)	0	40%	80.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Batch Plant	0	15%	83.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Mixer Truck	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Pump Truck	0	20%	82.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Saw	**1**	**20%**	**90.0**	**150**	**0.0**	**80.5**	**73.5**	**80.5**	**73.5**
Crane	0	16%	85.0	50	0.0	0.0	0.0	0.0	0.0
Dozer	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Drill Rig Truck	0	20%	84.0	50	0.0	0.0	0.0	0.0	0.0
Drum Mixer	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Dump Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Excavator	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Flat Bed Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Front End Loader	0	40%	80.0	50	0.0	0.0	0.0	0.0	0.0
Generator	0	50%	82.0	50	0.0	0.0	0.0	0.0	0.0
Generator (< 25KVA, VMS Signs	0	50%	70.0	50	0.0	0.0	0.0	0.0	0.0
Gradall	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Grader	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Grapple (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Horizontal Boring Hydraulic Jack	0	25%	80.0	50	0.0	0.0	0.0	0.0	0.0
Hydra Break Ram	0	10%	90.0	50	0.0	0.0	0.0	0.0	0.0
Impact Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Jackhammer	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Man Lift	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Mounted Impact Hammer	0	20%	90.0	50	0.0	0.0	0.0	0.0	0.0
Pavement Scarafier	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Paver	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Pickup Truck	0	40%	55.0	50	0.0	0.0	0.0	0.0	0.0
Pneumatic Tools	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Pumps	0	50%	77.0	50	0.0	0.0	0.0	0.0	0.0
Refrigerator Unit	0	100%	82.0	50	0.0	0.0	0.0	0.0	0.0
Rivet Buster/Chipping Gun	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Rock Drill	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Roller	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Sand Blasting (single nozzel)	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Scraper	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Shears (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Plant	0	100%	78.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Trenching Machine	0	50%	82.0	50	0.0	0.0	0.0	0.0	0.0
Soil Mix Drill Rig	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Tractor	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Excavator (Vac-Truck)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Street Sweeper	0	10%	80.0	50	0.0	0.0	0.0	0.0	0.0
Ventiliation Fan	0	100%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibrating Hopper	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Concrete Mixer	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Warning Horn	0	5%	85.0	50	0.0	0.0	0.0	0.0	0.0
Water Jet deleading	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Welder/Torch	0	40%	73.0	50	0.0	0.0	0.0	0.0	0.0
Maximum Construction Noise Level (Lmax and Leq):						**80.5**	**75.0**	**80.5**	**75.0**

Sources:
1. U.S. Department of Transportation, Federal Highway Administration, Roadway Noise Construction Model (RCNM), Software Version 1.1 (12/08/2008).
2. No noise shielding assumed.

Waterman Gardens Master Plan Project
Noise Source Levels for Construction Equipment
Based on Federal Transit Administration, Office of Planning and Environment

Noise Attenuation: 6 dBA per doubling of distance
(acoustically "hard" site)

Grading Phase Construction Equipment	Number of Units	Equipment Use Factor[1]	Lmax Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Lmax Noise Level @ Distance (dBA)	Without Noise Shielding Leq Noise Level @ Distance (dBA)	With Noise Shielding Lmax Noise Level @ Distance (dBA)	With Noise Shielding Leq Noise Level @ Distance (dBA)
All Other Equipment > 5 HP	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Auger Drill Rig	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Backhoe	**1**	**40%**	**80.0**	**100**	**0.0**	**74.0**	**70.0**	**74.0**	**70.0**
Bar Bender	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Blasting	0	1%	94.0	50	0.0	0.0	0.0	0.0	0.0
Boring Jack Power Unit	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Chain Saw	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Clam Shovel (dropping)	0	20%	93.0	50	0.0	0.0	0.0	0.0	0.0
Compactor (ground)	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Compressor (air)	0	40%	80.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Batch Plant	0	15%	83.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Mixer Truck	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Pump Truck	0	20%	82.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Saw	0	20%	90.0	50	0.0	0.0	0.0	0.0	0.0
Crane	0	16%	85.0	50	0.0	0.0	0.0	0.0	0.0
Dozer	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Drill Rig Truck	0	20%	84.0	50	0.0	0.0	0.0	0.0	0.0
Drum Mixer	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Dump Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Excavator	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Flat Bed Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Front End Loader	0	40%	80.0	50	0.0	0.0	0.0	0.0	0.0
Generator	0	50%	82.0	50	0.0	0.0	0.0	0.0	0.0
Generator (< 25KVA, VMS Signs	0	50%	70.0	50	0.0	0.0	0.0	0.0	0.0
Gradall	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Grader	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Grapple (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Horizontal Boring Hydraulic Jack	0	25%	80.0	50	0.0	0.0	0.0	0.0	0.0
Hydra Break Ram	0	10%	90.0	50	0.0	0.0	0.0	0.0	0.0
Impact Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Jackhammer	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Man Lift	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Mounted Impact Hammer	0	20%	90.0	50	0.0	0.0	0.0	0.0	0.0
Pavement Scarafier	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Paver	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Pickup Truck	0	40%	55.0	50	0.0	0.0	0.0	0.0	0.0
Pneumatic Tools	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Pumps	0	50%	77.0	50	0.0	0.0	0.0	0.0	0.0
Refrigerator Unit	0	100%	82.0	50	0.0	0.0	0.0	0.0	0.0
Rivet Buster/Chipping Gun	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Rock Drill	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Roller	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Sand Blasting (single nozzel)	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Scraper	**1**	**40%**	**85.0**	**100**	**0.0**	**79.0**	**75.0**	**79.0**	**75.0**
Shears (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Plant	0	100%	78.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Trenching Machine	0	50%	82.0	50	0.0	0.0	0.0	0.0	0.0
Soil Mix Drill Rig	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Tractor	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Excavator (Vac-Truck)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Street Sweeper	0	10%	80.0	50	0.0	0.0	0.0	0.0	0.0
Ventiliation Fan	0	100%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibrating Hopper	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Concrete Mixer	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Warning Horn	0	5%	85.0	50	0.0	0.0	0.0	0.0	0.0
Water Jet deleading	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Welder/Torch	0	40%	73.0	50	0.0	0.0	0.0	0.0	0.0
Maximum Construction Noise Level (Lmax and Leq):						**79.0**	**75.0**	**79.0**	**75.0**

Sources:
1. U.S. Department of Transportation, Federal Highway Administration, Roadway Noise Construction Model (RCNM), Software Version 1.1 (12/08/2008).
2. No noise shielding assumed.

Waterman Gardens Master Plan Project
Noise Source Levels for Construction Equipment
Based on Federal Transit Administration, Office of Planning and Environment

Noise Attenuation: 6 dBA per doubling of distance
(acoustically "hard" site)

Building Construction Phase Construction Equipment	Number of Units	Equipment Use Factor[1]	Lmax Noise Level @ 50 Feet[1] (dBA)	Equipment Distance (Feet)	Noise Shielding[2] (dBA)	Without Noise Shielding Lmax Noise Level @ Distance (dBA)	Without Noise Shielding Leq Noise Level @ Distance (dBA)	With Noise Shielding Lmax Noise Level @ Distance (dBA)	With Noise Shielding Leq Noise Level @ Distance (dBA)
All Other Equipment > 5 HP	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Auger Drill Rig	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Backhoe	0	40%	80.0	50	0.0	0.0	0.0	0.0	0.0
Bar Bender	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Blasting	0	1%	94.0	50	0.0	0.0	0.0	0.0	0.0
Boring Jack Power Unit	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Chain Saw	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Clam Shovel (dropping)	0	20%	93.0	50	0.0	0.0	0.0	0.0	0.0
Compactor (ground)	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Compressor (air)	**1**	**40%**	**80.0**	**100**	**0.0**	**74.0**	**70.0**	**74.0**	**70.0**
Concrete Batch Plant	0	15%	83.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Mixer Truck	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Pump Truck	0	20%	82.0	50	0.0	0.0	0.0	0.0	0.0
Concrete Saw	0	20%	90.0	50	0.0	0.0	0.0	0.0	0.0
Crane	**1**	**16%**	**85.0**	**100**	**0.0**	**79.0**	**71.0**	**79.0**	**71.0**
Dozer	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Drill Rig Truck	0	20%	84.0	50	0.0	0.0	0.0	0.0	0.0
Drum Mixer	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Dump Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Excavator	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Flat Bed Truck	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Front End Loader	**1**	**40%**	**80.0**	**100**	**0.0**	**74.0**	**70.0**	**74.0**	**70.0**
Generator	**1**	**50%**	**82.0**	**100**	**0.0**	**76.0**	**73.0**	**76.0**	**73.0**
Generator (< 25KVA, VMS Signs	0	50%	70.0	50	0.0	0.0	0.0	0.0	0.0
Gradall	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Grader	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Grapple (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Horizontal Boring Hydraulic Jack	0	25%	80.0	50	0.0	0.0	0.0	0.0	0.0
Hydra Break Ram	0	10%	90.0	50	0.0	0.0	0.0	0.0	0.0
Impact Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Jackhammer	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Man Lift	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Mounted Impact Hammer	0	20%	90.0	50	0.0	0.0	0.0	0.0	0.0
Pavement Scarafier	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Paver	**1**	**50%**	**85.0**	**100**	**0.0**	**79.0**	**76.0**	**79.0**	**76.0**
Pickup Truck	0	40%	55.0	50	0.0	0.0	0.0	0.0	0.0
Pneumatic Tools	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Pumps	0	50%	77.0	50	0.0	0.0	0.0	0.0	0.0
Refrigerator Unit	0	100%	82.0	50	0.0	0.0	0.0	0.0	0.0
Rivet Buster/Chipping Gun	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Rock Drill	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Roller	**1**	**20%**	**85.0**	**100**	**0.0**	**79.0**	**72.0**	**79.0**	**72.0**
Sand Blasting (single nozzel)	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Scraper	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Shears (on backhoe)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Plant	0	100%	78.0	50	0.0	0.0	0.0	0.0	0.0
Slurry Trenching Machine	0	50%	82.0	50	0.0	0.0	0.0	0.0	0.0
Soil Mix Drill Rig	0	50%	80.0	50	0.0	0.0	0.0	0.0	0.0
Tractor	0	40%	84.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Excavator (Vac-Truck)	0	40%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vacuum Street Sweeper	0	10%	80.0	50	0.0	0.0	0.0	0.0	0.0
Ventiliation Fan	0	100%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibrating Hopper	0	50%	85.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Concrete Mixer	0	20%	80.0	50	0.0	0.0	0.0	0.0	0.0
Vibratory Pile Driver	0	20%	95.0	50	0.0	0.0	0.0	0.0	0.0
Warning Horn	0	5%	85.0	50	0.0	0.0	0.0	0.0	0.0
Water Jet deleading	0	20%	85.0	50	0.0	0.0	0.0	0.0	0.0
Welder/Torch	**1**	**40%**	**73.0**	**150**	**0.0**	**63.5**	**59.5**	**63.5**	**59.5**
Maximum Construction Noise Level (Lmax and Leq):						**79.0**	**76.0**	**79.0**	**76.0**

Sources:
1. U.S. Department of Transportation, Federal Highway Administration, Roadway Noise Construction Model (RCNM), Software Version 1.1 (12/08/2008).
2. No noise shielding assumed.

Waterman Gardens Master Plan Project
Vibration Source Levels
Based on Federal Transit Administration, Office of Planning and Environment

Construction Equipment	Project Equipment	Equipment Velocity Decibels @ 25 Feet* (VdB)	Equipment Distance (Feet)	Estimated Velocity Decibels @ Distance** (VdB)
Pile Driver (Impact - Upper Range)		112	25	0
Pile Driver (Impact - Typical)		104	25	0
Pile Driver (Sonic - Upper Range)		105	25	0
Pile Driver (Sonic - Typical)		93	25	0
Clam Shover Drop (Slurry Wall)		94	25	0
Hydromill (Slurry Wall - In Soil)		66	25	0
Hydromill (Slurry Wall - In Rock)		75	25	0
Vibratory Roller		94	25	0
Hoe Ram		87	25	0
Large Bulldozer	**Yes**	**87**	**100**	**69**
Caisson Drilling		87	25	0
Loaded Trucks	**Yes**	**86**	**35**	**82**
Jackhammer		79	25	0
Small Bulldozer	**Yes**	**58**	**100**	**40**
Maximum Vibration Levels				**82**

Source:

U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment, *Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06)* , (2006) 12-11 and 12-12.

Notes:

* Value taken from Table 12-1.

** Based on the formula VdB = VdB(25ft) - 30 x LOG10 (D/25), where D is equal to the distance.

APPENDIX C

Mitigated Noise Technical Summary Report and Model Files

Technical Memorandum

Mitigation Measures to Bring Noise Levels into Compliance with San Bernardino Municipal Code requirements on Waterman Avenue and Base Line Street

July 17, 2011

PREPARED FOR:
Pyatok Architects
Housing Authority of the County of San Bernardino
The Planning Center/DCE

PREPARED BY:
Dan Burden, Senior Urban Designer
Walkable and Livable Communities Institute

Purpose:

The purpose of this technical memorandum is to provide background and guidance to allow noise calculation modelers to more fully reflect the street and urban design strategies called for in the Waterman Park project.

Traffic Sound Measurement Details:

For highway traffic noise, an adjustment, or weighting, of the high-and low-pitched sounds is made to approximate the way that an average person hears sounds. The adjusted sounds are called "A-weighted levels" (dB(A). Sound is measured logarithmically, so 60 dB(A) + 60 dB(A) = 63 dB(A), not 120 dB(A). In contrast, 60 dB(A) + 50 dB(A) = 60 dB(A). The perception of how "loud" a sound is varies by person. Generally, 3 dB(A) is considered the minimum audible difference between sound levels. A 10 dB(A) change is generally perceived to be 2x or 1/2 as loud depending of whether the sound is increasing or decreasing.

The Problem with Traffic Noise. Excessive traffic noise is one of the most common complaints among American residents. Millions of people are affected by constant traffic noise in their own home. In fact, traffic

Changes in Sound Level, dB(A)	Changes in Apparent Loudness
1	Almost imperceptible
3	Just perceptible
5 – 6	Clearly noticeable
10	Twice (or half) as loud

noise impacts more people than any other environmental noise source. Traffic noise can affect the ability to work, learn, rest, relax, sleep, etc. Excessive noise can lead to mental and physical health problems. *(Courtesy of Trafficnoise.org)*

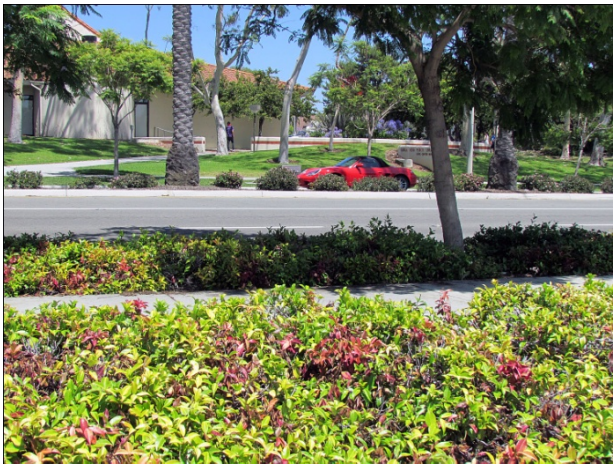
Base Line Street and Waterman Avenue.

Projected peak noise levels for Waterman Avenue and Base Line Street are 5-6 dB(A)s higher than permitted in the in San Bernardino code (70-71 dB(A) versus 65 dB(A). Changes are proposed for these roadways that will reduce noise levels. Note that a 5-6 dB(A) reduction in sound can cut the perceived noise in half. *(FHWA, Highway Traffic Noise)*

Negative sound reduction strategies.

Tall vertical sound walls are suggested by FHWA and Caltrans documents. But when walls are built they eliminate the desire to walk, to wait for transit, or even to bicycle. Also, when walls are built motorists are given a "signal" to drive even faster, significantly increasing overall area sound and increased roadway danger. Only when designers build to a true urban form, with homes and other buildings watching over the street, are overall traffic speeds and sounds brought under control..

Base Line Street today is a wide open roadway that is stark, flat, and uninviting. Its visual presence induces higher speeds than appropriate for an urban village. Significant changes in landscaping, streetscaping, building form, and roadway geometrics will help temper current speeds, and resultantly, help bring noise levels to acceptable levels.



Sound walls not only impact walking, waiting for transit and living on the near side and on the opposing side of the street. Sound is reflected back from the wall to the other side, which adds to the total sound load.

How can these reductions be expressed in a way to allow scientists to recalibrate their noise prediction model? Traffic noise is a result of a number of factors, including traffic volumes, traffic type, speed of vehicles (higher speeds increase sound intensity) and line of sight from the noise source to the receiver.

1. **Traffic volumes** are not expected to change as a result of the Waterman Gardens rebuild project in any significant way. If volumes were to increase, the effect is not likely to change sound levels. A slight increase in traffic volumes can dampen speeding, which can then bring noise levels down. *(Courtesy of Silence e-learning for Engineers)*
2. **Traffic type** (percentage of trucks versus autos) is not expected to change.
3. **Speed reduction** measures are planned as part of the Waterman Gardens proposal.

4. **Line of sight from source of sound to receiver**. The noise from automobile traffic is primarily from the tires on the pavement. In order to be effective, materials used to soften sound must block the line of sight from the noise source to the receiver. Since the majority of noise is emitted from automobile tires, low ground cover, raised medians with ground cover, parked automobiles and a sitting wall are each deemed to have a cumulative noise dampening effect.

How are speeds to be reduced? Streetscaping, adjacent land uses, street geometrics, intersection signal controls, urban street trees and ground cover plantings, and overall corridor and built environment designs, influence the speed that motorists drive. In general, the more attractive, enclosed, vertical and green a corridor, the lower speeds tend to be. The more sterile, stark, open, flat, gray and unattractive a corridor, the faster speeds tend to be. Specific examples, and reported changes are provided in this document.

Quantitative Changes. This memorandum provides treatments that reduce speeds and noise levels. For instance, "quiet pavements" made up of recycled tires, open-graded and/or rubberized asphalt, as well as other composites, reduces tire-to-pavement noise levels from 3 dB(A) to 10 dB(A), depending upon the existing and final paving material. The Road Noise Calculator suggests using 5 dB(A) with the following comment: Reduction is set at -5 dB(A). Somewhat optimistic, but achievable. Although a highly conservative approach to this sound reduction would be a 3-4 dB(A) reduction through an improved asphalt mix, it may be reasonable to specify a pavement mix that offers a 4-6 dB(A) reduction, and using the most modern approaches the maximum (9-12 dB(A), noise reduction can be achieved.

Another quantitative test, lane width reductions (12 feet to 10 feet) are proving to reduce speeds from 1-3 mph.

"Absorbing materials" used in a roadway environment will help reduce sound, as opposed to hard materials such as concrete and pavement. Absorbing soils are grass, forest floor or arable land, also snow. The maximum amount of absorption is around 4 dB(A).

Qualitative Measures. Also provided in this document are qualitative measures that are proving to bring down motorist speeds (hence yielding a reduction in noise levels). Many speed reduction strategies are more qualitative than quantitative. Aesthetics, block length, a more vertical urban form, rather than sprawl patterns can have dramatic effect on traffic speed. All of these changes are viewed as positive town building and social building measures, and are the antithesis of building tall sound walls, which are anti-city and anti-people measures.

A variety of comparative corridor redesigns which yield reduced speeds are cited. For example, LaJolla Boulevard, in Bird Rock (San Diego area) was rebuilt from a comparable width five-lane roadway section then transformed into a beautiful, placemaking street. Today LaJolla has added parking, bike lanes, reduced travel lane widths, medians, landscaped medians, and well landscaped edges. Traffic volumes remained the same. Speed reductions from 40 mph to 25 mph were achieved with the LaJolla Boulevard transformation. On LaJolla Boulevard, noise levels dropped from 60 dB(A) to 40 dB(A) (Conversation with Jim Stone, Walk San Diego). Note that a reduction of 10 dB(A) cuts the perceived noise in half, and thus a 20 dB(A) cuts perceived noise in half yet again, for a total reduction of 75%. Thus, speed is very significant.

Although we anticipate Waterman Avenue and Base Line Street to have lower speeds once construction is completed, speed reductions will not be as significant as found on LaJolla Boulevard, since some of the LaJolla treatments are not being installed here (especially roundabouts and lane removals). However, we anticipate a reduction of speeds on Base Line Street and Waterman Avenue from 40 mph to 35 mph.

These measures that are being introduced to Base Line and Waterman Avenue include:

Speed reduction measures. The below speed reduction measures are proposed for this project. Each measure is predicted to soften overall speeds.

- **Lane widths** -- Widths on these two streets will be reduced from 12 feet down to 10 feet. On average, lane width reductions in this range reduce speeds 1-3 mph.
- **Presence of parking** – The presence of on-street parking is found to slightly reduce speed, most likely 2-3 mph.
- **Bike lanes** – In the right context bike lanes create a visual narrowing of the roadway, and are felt to reduce speeds by 1-2 mph. This speed reduction is especially notable when lanes are colorized and when an extra width band demarcates lanes (8-10" wide stripe versus 6").
- **Medians** -- Medians placed close to travel lanes create a narrower appearing driving lane and are assumed to reduce speed in these conditions by 1-2 mph.
- **Trees and other vertical walls** – Motorists drive at slightly reduced speeds when in the proximity of a vertical wall of street trees. It is presumed that much of this speed reduction is a factor perceiving actual speed better when in close proximity to tall walls of street trees. This tends to be true with building placements (close placement creates enclosure), parking and related effects.
- **Ground cover** -- Ground cover, too, strengthens sense of enclosure to drivers.
- **Sidewalk location** – Sidewalks in this corridor will be setback 8 feet. Currently sidewalks are attached. When sidewalks are attached, motorists perceive the roadway environment to be wider and "faster," and hence tend to slightly increase speed.
- **Intersection spacing** -- In general, wide spacing between signalized intersections leads to higher corridor speed. Today, distances between intersections induces high speeds. Proposed treatments will add two additional signalized intersections to this corridor.
- **Signal progression** – Two additional signalized intersections are proposed for Baseline. It has been suggested that if these signals can be set in progression for lower speeds (i.e. 30-35 mph) that this will bring speeds into more appropriate levels for an urbanized environment.
- **Raised Intersection** – A raised intersection is one of the proposed alternatives -for helping curtail high end speeds. A raised intersection on a similar roadway in University Place, Washington, helped bring speeds into the proper levels for an urban community. Speeds are maintained around 30 mph within 500 feet of both the approach and departure sides of this intersection.

Materials noise reduction measures. The below placement of materials will lead to further noise reductions. Each measure is predicted to soften overall speeds. A cumulative effect is anticipated.

- **Pavement type ("quiet pavements")** – Use of quiet pavements will lead to a reduction in noise levels of 3 dB(A) to 12 dB(A) and a mix that maximizes this reduction is recommended.
- **Raised, lightly domed center medians** – Use of raised median islands that are domed then planted with dense materials can be anticipated to block the sounds emitted from tires in the Northern travel lanes. Anticipate a 2-3 dB(A) reduction from this measure.
- **Bicycle lanes** – Aside from the speed reduction mentioned above, presence of bike lanes moves traffic 6 feet further to the North from the nearest buildings.
- **Parking lanes** -- Aside from the speed reduction mentioned above, presence of bike lanes moves traffic 7 feet further to the North from the nearest buildings.
- **Planter strips** – A dense planting of materials will further deaden sound emitted from tires (line of sight interruption). This effect may yield a reduction of 1 dB(A).
- **Sitting walls** and landscaping material placed toward buildings– Sitting walls of 2.0 – 2.5 feet will block additional sound, and may provide a reduction of 1-2 dB(A).

These measures are considered cumulative.

Notes taken from literature found in FHWA, Caltrans, WSDOT:

1. In 1976, the U.S. Congress passed legislation requiring states to provide mitigation for highway noise (considered an environmental impact) as a part of all Type I Federal Aid projects at impacted locations where it is reasonable and feasible.

2. What is an impacted location? Any sensitive outdoor human use activity area that is predicted to have a design year traffic noise level of 66 decibels (A-weighted for human hearing) or greater.

3. Why was the impact level set at 66 dB(A)? Sixty-Six (66) dB(A) was chosen as the impact threshold because researchers have shown that above this level conversation between two people standing three feet apart and speaking in a normal voice is impaired.

Waterman Gardens
Assessed receiver levels - Mitigated Cumulative with Project

Obje	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
1	01House	GR	S	70.4	69.3	62.17	62.41	
2	02House	GR	S	70.2	69.1	61.99	62.25	
5	03House	GR	W	58.7	57.5	50.34	50.83	
6	04House	GR	N	56.3	55.0	47.81	48.46	
8	05House	GR	E	64.9	63.8	56.70	56.86	
9	06House	GR	E	64.2	63.2	56.07	56.19	
10	07House	GR	E	63.6	62.6	55.48	55.56	
11	08House	GR	E	60.0	59.0	51.82	52.00	
12	09House	GR	E	63.8	62.8	55.73	55.75	
13	10House	GR	E	63.8	62.8	55.75	55.75	
14	11House	GR	E	63.6	62.6	55.55	55.54	
15	12House	GR	E	63.6	62.6	55.52	55.50	
16	13House	GR	E	63.2	62.2	55.17	55.16	
17	14House	GR	E	63.6	62.6	55.52	55.49	
18	15House	GR	E	63.6	62.6	55.54	55.50	
19	16House	GR	E	62.7	61.7	54.65	54.63	
20	17House	GR	E	63.3	62.3	55.23	55.18	
21	18House	GR	E	63.0	62.0	54.96	54.92	
27	19School	SCH	W	62.8	61.8	54.59	54.71	
26	20School	SCH	W	61.9	60.9	53.73	53.85	
25	21School	SCH	W	61.5	60.5	53.28	53.42	
24	22School	SCH	W	61.3	60.3	53.15	53.28	
23	23School	SCH	W	61.0	60.0	52.81	52.93	
22	24School	SCH	W	60.7	59.7	52.51	52.61	
28	25House	GR	S	69.9	68.8	61.70	61.97	
29	26House	GR	S	70.5	69.4	62.28	62.57	
30	27House	GR	S	69.6	68.5	61.38	61.66	
31	28House	GR	S	69.4	68.3	61.16	61.43	
36	29House	GR	N	66.7	65.6	58.47	58.80	
32	30House	GR	S	71.6	70.5	63.41	63.70	
34	31House	GR	N	69.1	68.0	60.86	61.18	
35	32House	GR	N	67.6	66.5	59.33	59.72	
33	33House	GR	N	68.9	67.7	60.62	60.95	
37	34MHome	GR	W	55.2	53.8	46.69	47.41	

Waterman Gardens
Assessed receiver levels - Mitigated Cumulative with Project

Obje	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
38	35MHome	GR	SW	60.2	58.9	51.86	52.32	
39	36MHome	GR	NE	60.5	59.3	52.15	52.59	
40	37MHome	GR	NE	58.2	56.9	49.81	50.40	
41	38MHome	GR	NW	58.2	56.9	49.80	50.39	
42	39MHome	GR	NW	58.9	57.7	50.51	51.03	
43	40Church	MIX	N	59.7	58.5	51.34	51.86	
44	41House	GR	E	67.6	66.5	59.33	59.68	
45	42House	GR	E	76.6	75.6	68.44	68.49	
46	43House	GR	N	67.7	66.7	59.49	59.66	
47	44House	GR	S	59.0	57.6	50.33	51.22	
48	45House	GR	N	64.2	63.1	55.95	56.33	
50	46House	GR	N	63.6	62.4	55.26	55.74	
49	47House	GR	S	68.1	67.0	59.93	60.17	
51	48House	GR	S	65.6	64.4	57.27	57.71	
63	49House	GR	E	67.8	66.7	59.49	59.84	
64	50House	GR	E	68.4	67.4	60.18	60.45	
66	51Church	MIX	E	76.3	75.3	68.18	68.27	
67	52House	GR	S	67.5	66.4	59.16	59.57	
65	53House	GR	S	65.5	64.3	57.03	57.71	
53	54House	GR	S	62.6	61.3	54.29	54.83	
55	55House	GR	S	61.4	60.1	53.09	53.63	
57	56House	GR	S	60.6	59.2	52.31	52.85	
59	57House	GR	S	59.5	58.1	51.21	51.75	
62	58House	GR	S	60.9	59.5	52.67	53.10	
61	59House	GR	N	58.5	57.1	49.92	50.74	
60	60House	GR	N	58.8	57.4	50.25	51.06	
58	61House	GR	N	59.2	57.9	50.73	51.50	
56	62House	GR	N	59.7	58.4	51.23	51.99	
54	63House	GR	N	61.0	59.7	52.54	53.21	
52	64House	GR	N	62.4	61.1	53.99	54.54	
3	65House	GR	E	64.4	63.2	56.04	56.57	
68	66House	GR	N	72.4	71.3	64.18	64.43	
7	67House	GR	S	70.3	69.1	62.02	62.35	
70	72Project	GR	N	67.8	66.6	59.51	59.97	

Waterman Gardens
Assessed receiver levels - Mitigated Cumulative with Project

Obje	Name	Usage	Dir	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)	
69	73Project	GR	W	72.7 73.0	71.7 72.0	64.56 64.91	64.62 64.96	
71	74Project	GR	N	69.1	67.9	60.80	61.12	
72	75Project	GR	N	69.0	67.9	60.78	61.09	
75	76Project	GR	S	64.3	63.1	55.99	56.44	
73	77Project	GR	E	61.8	60.7	53.62	53.78	
74	78Project	GR	S	63.3	62.1	55.02	55.41	
76	79Project	GR	N	68.8	67.6	60.52	60.83	
77	80Project	GR	N	68.2	67.0	59.89	60.25	
78	81Project	GR	N	68.6	67.5	60.36	60.68	
79	82Project	GR	N	68.6	67.4	60.29	60.62	
80	83Project	GR	N	68.6	67.5	60.36	60.69	
81	84Project	GR	N	68.7	67.5	60.39	60.72	
82	85Project	GR	N	68.6	67.5	60.37	60.71	