TECHNICAL MEMORANDUM

TO: Mike Blumen, Blumen Consulting Group, Inc.

FROM: Shannon Khounnala

DATE: December 2007

RE: NOISE TECHNICAL REPORT
NEW WHATCOM REDEVELOPMENT PROJECT
PORT OF BELLINGHAM
BELLINGHAM, WASHINGTON

INTRODUCTION

The purpose of this Noise Report is to describe traffic and other noise source characteristics for the New Whatcom Redevelopment project and evaluate potential impacts and mitigation measures.

The project area is located within the City of Bellingham's Central Business District Neighborhood Planning area. The site is generally bounded by Bellingham Bay to the west, Roeder Avenue and State Street to the north and east, and Cornwall Avenue to the south. The large project site is further divided into 10 redevelopment areas for analysis purposes, as shown on Figure 1. Redevelopment Area 1 is bounded on the north by Roeder Avenue and on the south, east, and west by Bellingham Bay; and Redevelopment Areas 2 through 10 are bounded on the north by Chestnut Street, on the east by Cornwall Street, and on the south and west by Bellingham Bay. In order to evaluate both the onsite noise and offsite noise, however, the study site extends beyond the project site to include the major traffic noise sources surrounding the project site: Roeder Avenue, West Holly Street, North State Street, and Boulevard Street (Figure 1).

Realignment or expansion of a roadway can alter a noise source's proximity and effects to the surrounding natural and built environment. Noise can negatively affect people in many ways. Noise may affect an individual's ability to hear the surrounding environment. It may create confusion in wildlife, or annoyance in humans. Ultimately, noise may alter peoples' lives by limiting the ability to communicate or sleep, among other things.

Acceptable noise levels must be met as mandated by federal, state, or local governments. These governmental entities provide guidelines for allowable noise levels in order to protect the health and well-being of the public. According to the federal highway traffic noise standards, 23 CFR 772, the three primary triggers for conducting a traffic noise analysis are:

- Construction of a new roadway
- Significant changes to the horizontal and vertical alignment of an existing roadway
- Increasing the number of through traffic lanes on an existing roadway.

Because this project will involve the construction of new roadways on the New Whatcom site, and may change the horizontal and vertical alignment of some existing roadways, this noise report has been prepared to evaluate any potential impacts.

This report contains a description of the analysis methodology and applicable regulations used to assess the affected environment and evaluate the potential noise impacts of the project. The methodology discussion is followed by an analysis of the existing noise conditions of the study area, thresholds to determine if the proposed project would result in significant impacts, anticipated impacts (direct, indirect, and cumulative), and mitigation measures.

BACKGROUND AND METHODS

Noise Terminology

Noise is defined as unwanted sound. The method commonly used to quantify environmental noise involves evaluation of all frequencies of sound, with an adjustment to reflect the fact that human hearing is less sensitive to low and high frequencies than to midrange frequencies. This measurement adjustment is called “A-weighting.” A noise level so measured is called the A-weighted sound level measured in A-weighted decibels (dBA). In practice, environmental noise is conveniently measured using a sound level meter that includes an electronic filter corresponding to the A-weighted curve. Table 1 provides examples of typical A-weighted noise levels, and their subjective loudness and effects. To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. Time averages are typically expressed in terms of the Equivalent Level (Leq), a steady-state energy level equal to the energy content of the time-varying period.

The human response to environmental noise is subjective and varies considerably from individual to individual. The effects of noise can range from interference with sleep, concentration, and communication, to the causation of physiological and psychological stress, and, at the highest intensity levels, hearing loss. Noise is attenuated as it propagates from the source to the receiver. Attenuation is logarithmic, rather than linear, so that, for instance, a doubling of traffic volumes will result in a 3-dBA increase in traffic-dominated noise environments. For line sources, such as streets, noise levels decrease by 3 to 5 dBA for every doubling of distance from the source. For point sources, noise levels decrease more rapidly, about 6 dBA for every doubling of distance from the source. Topography and the type of surface (paved or vegetated) also play a role in noise attenuation characteristics.

One way of estimating a person's subjective reaction to a new noise is to compare the new noise environment with the existing noise environment to which the person has become adapted; i.e., the increase over the so-called “ambient” noise level. Research in the area of perceived impacts of various degrees of increase in A-weighted noise levels indicates the following (Kryter, 1985):

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in noise level of at least 5 dBA is required before any noticeable change in community response would be expected.
- A 10-dBA increase is subjectively heard as approximately a doubling in loudness and almost always causes an adverse community response.

In assessing the impact of noise upon the environment, the nature and level of activities that generate the noise, the pathway through which the noise travels, the sensitivity of the receptor, the period of exposure and the increase over the ambient noise levels are all considered.

Table 1
NOISE LEVELS OF REPRESENTATIVE SOUNDS

Noise Source (distance)	Decibels (dBA)	Description
Jet takeoff (nearby)	150	
Pneumatic riveter	130	
Jet takeoff (60 meters)	120	Pain threshold
Construction noise (3 meters)	110	
Subway train	100	
Heavy truck (15 meters)	90	Constant exposure above this level endangers hearing
Average factory	80	
Busy traffic	70	

Noise Source (distance)	Decibels (dBA)	Description
Normal conversation (1 meter)	60	
Quiet office	50	Quiet
Library	40	
Soft whisper (5 meters)	30	Very quiet
Rustling leaves	20	
Normal breathing	10	Barely audible
Hearing threshold	0	

Source: Tipler, 1976

NOISE REGULATIONS

Regulatory Framework

Federal, state and local governments have established noise standards and guidelines to protect citizens from potential hearing damage and various other adverse physiological and social effects associated with noise. These regulations are divided into three groups, traffic-related noise, environmental noise, and construction noise. The guidelines and regulations that pertain to noise conditions in the study area are discussed below.

Traffic-Related Noise Regulations

Federal Highway Administration

The Federal Highway Administration (FHWA) provides policies for state highway agencies in the U.S. Code of Federal Regulations (CFR) *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (23 CFR 772). The criteria established by 23 CFR 772 are provided in Table 2. FHWA guidance states that effects from noise “occur when the predicted traffic noise levels approach or exceed the noise abatement criteria or when the predicted traffic noise levels substantially exceed the existing noise levels” (23 CFR §772.5[g]). This criterion allows individual states to establish a definition of “substantially exceed.” If it is determined that there is an adverse effect from noise based on the state defined criteria, the FHWA requires that noise mitigation measures be evaluated with primary consideration given to exterior areas with frequent human use.

Table 2
FEDERAL HIGHWAY ADMINISTRATION / WASHINGTON STATE DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT CRITERIA

Activity Category	Leq in dBA	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above
D	–	Undeveloped lands
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Washington State Department of Transportation

The Washington State Department of Transportation (WSDOT) Noise Abatement Criteria (NAC) specify exterior noise levels related to traffic for various land activity categories where frequent human use occurs, as presented in Table 2. For residences, parks, schools, churches, hospitals, and similar areas, the noise abatement criterion is 67 dBA. Federal and state regulations define the effects of noise based on noise levels that "approach" or exceed the NAC. Because WSDOT defines "approach" as being within 1 dBA of the NAC, an adverse effect from traffic noise would occur at these receivers if predicted noise levels are 66 dBA or higher. Similarly, for commercial establishments, the noise abatement criterion is 72 dBA, and an adverse effect from traffic noise would occur at these locations if predicted noise levels are 71 dBA or higher.

WSDOT considers a "substantial increase" to be a 10 dBA increase if the resulting noise level is greater than 50 dBA. Outdoor activity areas with noise levels of 75 dBA or higher and indoor areas of 60 dBA or higher are defined as a "severe exceedance of the NAC." Severe exceedance of the NAC is also considered when future noise levels are predicted to increase 15 dBA or higher over existing noise levels.

Impacts and potential mitigation are only considered for sensitive receivers that are existing on or adjacent to the site or if a building permit for development has been granted prior to the planning and construction of the widened or new roadway. In other words, noise is not considered an impact that would require mitigation for future potential receivers that have not yet been developed.

Local Regulations

The City of Bellingham (City) does not have a specific noise ordinance that provides jurisdictional direction for the evaluation of traffic noise. The City has adopted the Washington State Department of Ecology (Ecology) noise regulations as defined in Washington Administrative Code (WAC) 173-60; however, these regulations do not apply to traffic-related noise. Additional information regarding WAC 173-60 is discussed in Environmental Noise Regulations below.

Environmental Noise Regulations

State and Local Regulations

Ecology regulates only environmental noise (WAC 173-60), which is limited to noise sources such as concerts, generators, manufacturing plants, and other commercial/industrial operational activities, including marine vessel traffic. Vehicular traffic and train noise are exempt from Ecology's noise limitations.

Ecology is responsible for establishing maximum noise levels allowed in an area or environment and, in particular, limitations of noise at property lines (WAC 173-60). The land use categories or Environmental Designations for Noise Abatement (EDNAs) specified in Ecology's regulations correspond to residential, commercial, and industrial zoning classifications determined by the City. The maximum noise level allowed at a property boundary depends on the current land use (EDNA) of both the noise source and receiving property (property where the noise is audible).

The WAC outlines the EDNAs, which establish maximum permissible noise levels at property boundaries. Various properties are grouped as followed:

- **Class A:** Often classified by local governments as residential. Lands where human beings reside and sleep: residences, multiple family living accommodations, recreational and entertainment properties (camps, parks, and camping facilities), and community services (hospitals, health and correctional facilities).

- **Class B:** Often classified by local governments as commercial. Lands involving uses that require protection against noise interference with speech: retail services, recreation and entertainment not used for habitation (schools, churches, cultural facilities), and commercial living/dining establishments (hotels/motels, restaurants).

- **Class C:** Often classified by local governments as industrial. Lands involving economic activities of such a nature that higher than average noise levels are to be anticipated: storage and warehouse facilities, property used for production of crops, and wood products or livestock.

The proposed New Whatcom mixed-use redevelopment will include Class A, B, and C noise sources. The surrounding land uses (receiving property) are also a mix of Class A (residential), Class B (commercial), and some limited Class C (industrial) environments. Compliance with these regulatory limits is judged separately for each source. In other words, the regulations prohibit a source from generating more than the specified amount of sound at the receiving location. They do not require the cumulative sound generated by all sources to remain below the specified levels. Maximum permissible noise levels are established for each class of property. These noise levels are outlined in Table 3.

Table 3
MAXIMUM PERMISSIBLE ENVIRONMENTAL NOISE LEVELS (IN dBA)

EDNA Noise Source	EDNA Receiving Property		
	Class A	**Class B**	**Class C**
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

Source: WAC 173-60

Although not specifically stated in the WAC the noise abatement criteria are assumed to be presented as Leq. For noise-sensitive areas or areas that fall under Class A (residential areas), the noise abatement criterion is an Leq of 60 dBA when the noise originates from a Class C site. For areas that fall under Class B (commercial areas), the noise abatement criterion is an Leq of 65 dBA, when the noise originates from a Class C (industrial) site. For areas that fall under Class C, the noise abatement criterion is an Leq of 70 dBA when the noise originates from a Class C site. Between the hours of 10:00 PM and 7:00 AM, the noise limitations are reduced by 10 dBA for receiving properties within Class A areas. However, at any hour of the day, the applicable noise limitations may be exceeded by no more than one of the following:

- 5 dBA for a total of 15 minutes in any 1-hour period
- 10 dBA for a total of 5 minutes in any 1-hour period
- 15 dBA for a total of 1.5 minutes in any 1-hour period.

In addition to the above noise exceedance provisions, there are a number of exemptions provided in WAC 173-60-040 that may pertain to some of the planned redevelopment efforts of the New Whatcom site, including:

- Sounds created by motor vehicles
- Sounds originating from aircraft in flight and sounds that originate at airports directly related to flight operations
- Sounds created by surface carriers engaged in interstate commerce by railroad
- Sounds originating from officially sanctioned parades and other public events
- Sounds originating from temporary construction sites as a result of construction activity (except insofar as such provisions relate to the reception of noise within Class A EDNAs between the hours of 10:00 PM and 7:00 AM)
- Noise from electrical substations and existing stationary equipment used in the conveyance of water, wastewater, and natural gas by a utility, between the hours of 7:00 AM and 10:00 PM.

In addition to the above Washington State Environmental Noise Regulations, the City has established a Public Disturbance Noise Ordinance (BMC 10.24.120). This approach to control noise problems applies subjective "public disturbance noise" standards, which do not require the use of decibel meters for enforcement. The current City code provides for local regulation of frequent, repetitive, or continuous sounds within a residentially zoned area that may be found to unreasonably disturb or interfere with the peace, comfort, and repose of others.

Construction Noise Regulations

Federal Highway Administration

Under normal circumstances, FHWA does not require any modeling or detailed analysis for construction traffic noise due to the temporary nature of the noise. Most projects will fall under this general provision provided that construction is scheduled for daylight hours and the construction period will be short-term or phased to provide noise-related relief to nearby sensitive receivers. Impacts from construction noise are generally not serious; however, FHWA does require that potential impacts be generally identified and a reasonable effort made to include abatement measures into the project plans and specifications (23 CFR §772.19).

State and Local Regulations

In most cases, daytime noise from construction activities is exempt from state and local laws. This general exemption is provided in the Environment Noise Regulations outlined in WAC 173-60. These provisions acknowledge that construction noise is temporary but may affect nearby property owners or residents. Ecology and WSDOT request that during project development, planning and design documents should consider ways to reduce or mitigate the noise impacts of construction activities. All reasonable methods of noise mitigation shall be incorporated in the plans and specifications of the contract.

For local regulatory construction, some jurisdictions regulate construction site noise by establishing designated hours for permitted construction for certain zones, such as in or near residential areas. Others regulate construction noise through a provision in their general noise control ordinance. The City of Bellingham does both. The Public Disturbance Noise Ordinance within the Bellingham Municipal Code (BMC) limits construction noise within residentially zoned areas during the hours of 7:00 AM and 10:00 PM (BMC 10.24.120).

Coordination with local agencies on construction efforts that may involve intrusive noise activities, such as noise generated by pile-driving, blasting, or demolition, etc., may be warranted. Some acoustical information, duration, and timelines may be requested by the local agency before construction commences. This is done on a case-by-case basis (WSDOT 2006). Special construction permitting is generally analyzed in detail only when it would affect a sensitive receptor over a long period of time. In some circumstances, however, even a shorter-term construction phase may affect highly sensitive locations (such as schools, hospitals, etc.), warranting further analysis.

METHODOLOGY

This report provides a quantitative estimate of traffic-related noise impacts and a qualitative discussion of environmental noise. Because environmental noise is regulated at the source and the receiving location, it is not possible to determine specific environmental noise levels unless the nature of the noise source and the exact distance to the receiving property are known.

The following section outlines the methodology used to perform a quantitative traffic noise analysis within the study area. Traffic noise studies are conducted using a step-by-step process. The basic method WSDOT uses for a traffic study is as follows:

1. Review all applicable federal, state, and local criteria for traffic noise analyses. These criteria provide approved methods, including the proper traffic noise model and noise abatement criteria for evaluating the project's potential effects.

2. Establish the project area and study area, and perform field reconnaissance to identify noise-sensitive land uses (for example, parks).

3. Select noise measurement locations that will best characterize the existing noise environment. This includes locations that help to describe the overall traffic noise levels as well as identify other major noise sources in the project area.

4. Select the proper noise measurement equipment and adhere to methods that will meet or exceed the federal, state, or local measurement standards.

5. Measure onsite noise levels to establish the existing noise environment. Collect traffic volume and speed data and make note of all existing topography that affects the transmission of noise.

6. Develop the Traffic Noise Model (TNM) using the existing roadway alignments and the counted traffic flow. Input the field-collected noise monitoring data to verify (or validate) that the TNM accurately predicts traffic noise levels at all monitoring locations.

7. Model existing project corridor traffic noise levels using the peak-hour traffic volumes generated by the transportation team and posted speed limits.

8. Model future project corridor traffic noise levels using the peak-hour traffic volumes generated by the transportation team and posted speed limits. Future conditions include all possible alternatives: no build Alternative and the build alternatives.

9. Evaluate potential effects of construction-related noise for the build alternatives. Calculate peak construction noise levels based on the equipment to be used, distance from the construction zones to receivers, and the duration and time of the construction.

10. Compare the modeled noise level results to the project traffic noise criteria to determine if and where noise mitigation should be considered.

Equipment and Methods Used

A Norsonic Type 118 model, Type 1 sound level meter was used to measure noise generated by vehicle traffic in the study area. The meter used an A-weighted scale for decibel measurement. A fast response time was measured at a standard 5-foot height (average ear height) for all field measurements. The meter was calibrated before field measurements were taken using a Norsonic Type 1251 sound level calibrator. The sound meter receives an annual calibration at a National Institute of Standards and Technology-certified traceable calibration laboratory. Noise measurements were taken in a manner consistent with WSDOT's *Traffic Noise Analysis and Abatement Policy and Procedures* (WSDOT, 2006), WSDOT's *Environmental Procedures Manual*; Section 446 Noise (WSDOT, 2007), and FHWA's *Measurement of Highway-Related Noise* (USDOT, 1996).

Noise measurements were recorded at five locations within the project study area (shown on Figure 1 and Table 4). Traffic noise within the study area was measured at locations representative of the surrounding residential and commercial land uses. Representative receivers were selected based on their location to represent a grouping of sensitive receivers, which share common characteristics such as the same elevation, location in the project area, or similar activity type (residential or commercial property). Noise produced by traffic was measured at an interval of 15 minutes, allowing sufficient time for the sound meter to stabilize. At each location, a tally of passing traffic was noted for use in the validation for predicting future traffic-related noise.

Traffic Model Validation

Each project site has its own unique terrain, topography, vehicle distribution, man-made and natural barriers, and flow control devices. The TNM is capable of modeling many elements of a project site. Computer models must be validated with the field measurements made specifically at each unique project site. With this model validation, confidence in predicted noise levels is achieved.

Model validation is performed by creating a base model of the project site and comparing the results of the predicted noise levels with the field-measured noise levels. If base model results fall within 2 dBA of the field-measured data, the base model is considered valid and the project-related models (action and no action models) are developed using the validated base model. If the base model results do not fall within 2 dBA, model elements are edited until the model is accurately calibrated. Table 4 presents the successful model validation results.

Table 4
MODEL CALIBRATION RESULTS

Field Measurement Location ID (see Figure 1)	Measured Noise Level (dBA)	TNM-Predicted Noise Level (dBA)	Difference Between TNM and Actual Noise Levels (dBA)
RM1	72	70	-2
RM4	69	68	-1
RM5	69	67	-2
RM11	73	72	-1
RM12	72	70	-2

Once validation of the noise model is completed, the noise related to the existing conditions and two of the redevelopment alternatives, Alternative 1 and Alternative 3, and the No Action Alternative were evaluated. Because the traffic volumes for Alternatives 2 and 2a are not substantially different from either Alternative 1 or Alternative 3, to create an audible difference in noise levels, only the higher-density and lower-density redevelopment alternatives were evaluated for comparison purposes.

Traffic Model Assumptions

For conservatism, and as is standard practice in the description of traffic-generated noise, the modeling assumed a number of conditions that are favorable for sound propagation. These inherently conservative factors and assumptions result in a noise model that will tend be biased to higher predicted values than would be expected in the actual environment around the proposed project site. This "worst-case" approach includes conservative selection of model inputs, such as ground surface, traffic volumes, vehicle type, and weather. Key assumptions used for the TNM include:

- TNM default values of 50 percent relative humidity, 20°C temperature, and average pavement type were used.
- The height above ground for all receivers was 1.5 meters (approximately 5 feet), which corresponds to ear height.
- The ground surface for the overall study area was assumed to be 100 percent pavement, providing a "worst-case" sound level result.
- The PM peak-hour traffic volumes were used on roadways in the study area to predict conservative, "worst-case" results.
- The percentage of trucks on the roadways within the study area ranges from 2 to 10 percent, which includes both medium and heavy trucks. Other than automobiles, heavy trucks were the only other vehicle modeled in TNM. This assumption provides a "worst-case" scenario of truck-related noise.

Based on the use of "worst-case" model inputs in the TNM, actual noise levels are expected to be lower than predicted levels during off-peak hours.

AFFECTED ENVIRONMENT

Existing Site Conditions

The existing project site supports industrial uses with limited public access. The City adopted the updated *Bellingham Comprehensive Plan* in June 2006 and designated the New Whatcom site as "Industrial/Waterfront Mixed-Use." The Comprehensive Plan promotes the development of an urban village (the Central Waterfront District Village) on the site under the

Waterfront Mixed-Use zoning designations, subject to the approval of a Master Development Plan. As part of the update to the Comprehensive Plan, the City adopted policies that establish the framework for redevelopment of the New Whatcom site. The City also amended the Central Business District Neighborhood Plan and zoning to designate the site for industrial/waterfront mixed uses, upon the adoption of a Master Development Plan. This action will allow for the future development of mixed uses on the site to include future residential, commercial, and industrial receivers.

The remaining study area, surrounding the proposed project site, includes single-family and multi-family residences, a city park adjacent to West Holly Street, a trail south of Cornwall Avenue, and numerous industrial and commercial spaces. The existing noise environment in the vicinity of the project site is typical of urban areas characterized by noise levels generated by vehicular traffic on nearby streets and highways, passing trains, occasional aircraft flyovers, barking dogs, lawn mowers, etc. Although the existing New Whatcom site supports a variety of industrial land uses, these noise sources were not heard during the site visit and are considered to contribute limited noise to the existing ambient conditions in the surrounding area.

The dominant noise source in the study area is vehicular traffic on the existing roadway network. The primary noise roadways include Roeder Avenue to East Chestnut Street, West Holly Street, and North State Street to Boulevard Street. Each of these roadways carries traffic within the vicinity of sensitive noise receivers that are located within the study area. Due to the urban roadway network throughout the study area, traffic noise at any specific location can become intermittent, varying with the timing of the signals and the traffic volume.

The terrain at the New Whatcom site is generally flat. Offsite, however, steep terrain exists on the north side of Roeder Avenue and the south side of Cornwall Avenue surrounding the New Whatcom project site. This terrain affects the propagation of sound within the project study area and has been included in the noise model. Ground cover is primarily paved impervious surface both onsite and offsite with the exception of small landscaping areas and park features.

Noise is also generated by the Burlington Northern Santa Fe (BNSF) railway line that runs to the north of Roeder Avenue, through the New Whatcom site, and parallel to Boulevard Street at the south end of the site. Based on information from BNSF railway, an average of four freight trains make round-trip circuits through the Bellingham area each day en route to and from Canada. Other train activity includes three local freight trains serving businesses within the City, and one night freight train from Bellingham to Everett (Fishman, 2007).

Passenger service along the BNSF railway is operated by Amtrak. The nearest station is the transit center south of the New Whatcom site located at 401 Harris Avenue in Bellingham. Amtrak's Cascades route provides service along the BNSF railway from Vancouver, British Columbia to Eugene, Oregon. Amtrak operates four daily trains with two southbound trains and two northbound trains.

For discussion purposes, train noise was noted during the field visit and was measured while the trains were passing. Train noise within the study area was found to contribute substantially to the ambient noise environment. Noise levels were documented to sustain 78 to 82 dBA while passing. It is expected that this noise source will continue to operate well into the future with some limited growth expected. As discussed in the State and Local Environmental Noise Regulations section above, train noise is exempt from environmental noise provisions outlined by the WAC.

Existing Traffic Noise Conditions

For comparison purposes, Table 5 shows the five field-measured representative receiver locations and eight additional TNM-modeled receivers, for a total of 13, within the study area for the existing 2007 noise levels versus the WSDOT/FHWA traffic impact criteria. Representative receivers were selected based on their location to represent a grouping of sensitive receivers, which share common characteristics such as the same elevation, location in the study area, or similar activity type (residential or commercial property). Each representative receiver location is identified on Figure 1 and in Table 5. Determination of the existing conditions traffic was based on data generated by The Transpo Group and presented in a Transportation Discipline Report (The Transpo Group, 2007). As shown in Table 5, all receivers, with the exception of those currently located off the primary roadway network (identified as Receiver R7 and R8), currently experience noise levels at or above the FHWA/WSDOT noise impact criteria.

Noise measurements collected in the field and modeled with the TNM characterize the study area as typical of an urban, high-density environment. A number of conditions contribute to the high noise levels in the study area, including the existing traffic volumes, frequency of signalized and stop-controlled intersections, proximity of receivers to the roadways (often less than 30 feet), and topography changes requiring vehicles to accelerate and decelerate with the change in elevation.

Table 5
PREDICTED EXISTING TRAFFIC NOISE LEVELS (IN dBA)

Representative Receiver Number	Description of Location	FHWA / WSDOT Traffic Noise Criteria	Field-Measured Noise Levels	TNM-Predicted 2007 Existing Conditions
RM1	Ground floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	67	**72**	**71**
R2	Second floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	67		**71**
R3	Third floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	67		**71**
RM4	Residential home on north side of West Holly Street. Frequent outdoor area faces West Holly Street	67	**69**	**67**
RM5	Public Park, north side of West Holly Street	67	**69**	**67**
R6	Commercial District near intersection of West Holly Street and Cornwall Avenue	72		**71**
R7	Second floor residential condominium along Railroad Avenue; frequent outdoor area faces New Whatcom site	67		60
R8	Third floor residential condominium along Railroad Avenue; frequent outdoor area faces New Whatcom site	67		60
R9	Second floor residential condominium along North State Street; frequent outdoor area faces Cornwall Avenue	67		**71**
R10	Third floor residential condominium along North State Street; frequent outdoor area faces Cornwall Avenue	67		**70**
RM11	Ground floor condominium or home adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	67	**73**	**73**
RM12	Second floor condominium adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	67	**72**	**72**
RM13	Third floor condominium adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	67		**72**

RM # Field-measured and TNM-modeled receiver.
R # TNM-modeled receiver.
Bolded values indicate the FHWA/WSDOT noise abatement criteria have been exceeded.

IMPACTS

Construction Impacts

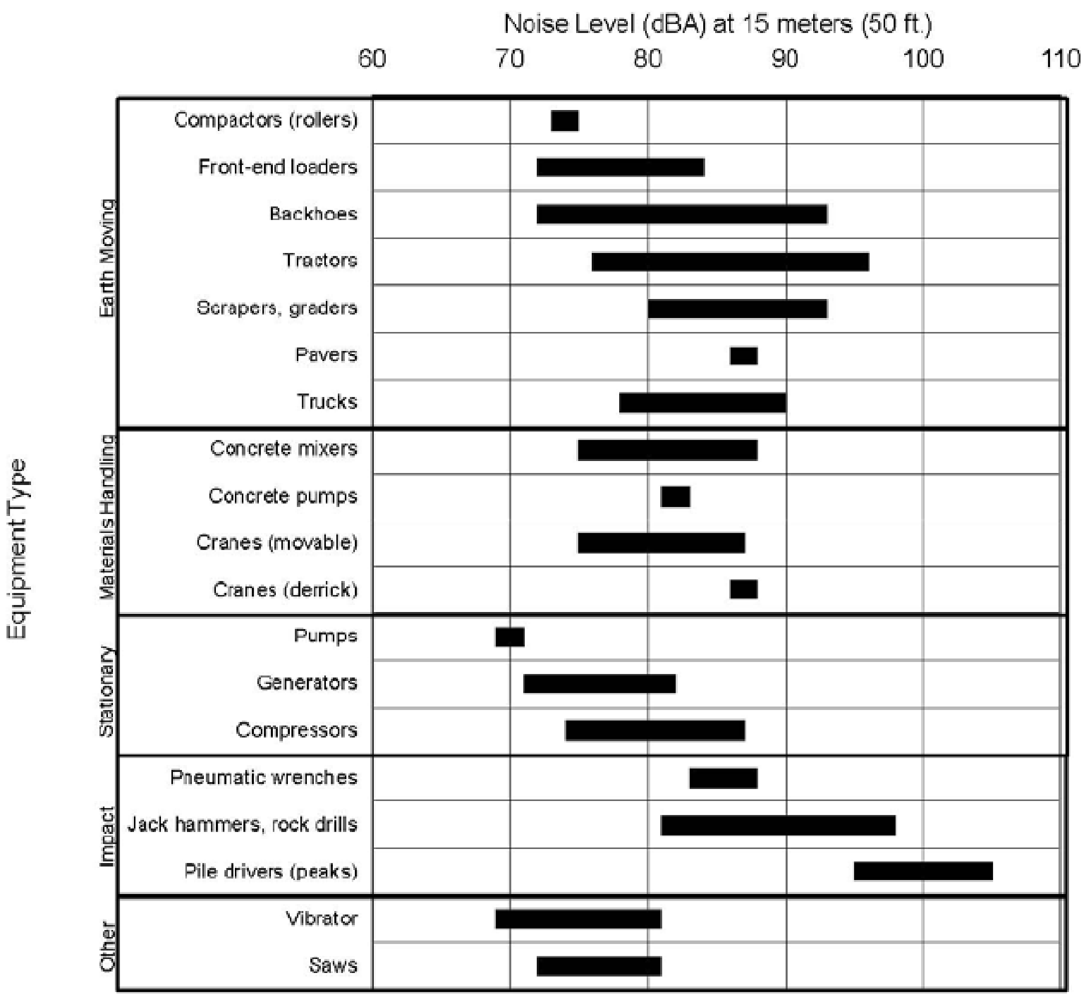
All redevelopment alternatives are expected to have some level of initial and ongoing phased construction as the area is changed from an industrial land use to a mixed use. For purposes of environmental review, it is assumed that the infrastructure projects would be generally similar for all redevelopment alternatives, although Alternative 1, the Higher Density Alternative, would entail the largest level of infrastructure improvements. Despite this, construction activities and related noise levels generally would be the same regardless of the redevelopment component. This is because each of the redevelopment actions includes similar forms of construction activities such as clearing, grading, excavating, demolition, material supply delivery, and heavy equipment usage. Each of the alternatives includes various forms of new roadway development, marina and in-water development, and recreational development (parks and trails) that will be implemented in an initial phase and primarily completed by 2016. Some of these alternatives also include the relocation of a portion of the railroad. If a relocation of the railroad is pursued, this action would be subject to a specific permitting and environmental review process that would be undertaken by BNSF/WSDOT in the future. A review of noise impacts would likely to be part of that environmental process.

The noise levels generated by construction equipment would vary greatly depending on factors such as the type and specific model of equipment, the operation being performed, and the condition of the equipment. The average sound level of the construction activity also depends on the amount of time that the equipment operates and the intensity of the construction during the time period.

Controlling construction noise can pose special problems for contractors. Unlike general industry, construction activities are not always stationary and in one location. Construction activities often take place outside where they can be affected by weather, wind tunnels, topography, atmosphere, and landscaping. Construction noise sources, e.g., heavy earth-moving equipment, can move from location to location and are likely to vary considerably in their intensity throughout a work day. Each construction project will require different types and scales of construction equipment at different locations within the New Whatcom site. Thus, it is not possible to define which activity would be likely to produce the highest offsite or onsite noise. Additionally, the construction contractor may mobilize more than one crew, or areas under construction may simultaneously occur in different locations and would affect different receivers.

Construction equipment would include standard equipment, such as graders, scrapers, backhoes, loaders, cranes, dozers, water trucks, jackhammers, portable generators, air compressors, and miscellaneous trucks. Specialized equipment use, such as pile-drivers, could be frequent during construction of the project components such as multiple-story support structures for buildings and parking facilities, and bridge connections. The most prevalent noise sources during construction would be the pile-driving and various engines, particularly diesel, that power equipment. At this time, the specific type of pile-driving, drilled or driven, is not yet known. The maximum noise level ranges for various pieces of construction equipment at a distance of 50 feet are depicted in Table 6 below. The maximum noise levels at 50 feet would range from approximately 65 to 106 dBA for the type of equipment normally used for this type of project.

Table 6
TYPICAL CONSTRUCTION EQUIPMENT NOISE GENERATION LEVELS



Sources: EPA, 1971; WSDOT, 1991.

Construction noise in a well defined area typically attenuates at approximately 6 dBA per doubling of distance. Therefore, at a distance of 100 feet, the maximum levels would decrease by approximately 6 dBA relative to the levels identified in Table 6. This attenuation is shown on Figure 2, illustrating a typical piece of construction equipment and the decrease in noise for every doubling of distance.

Existing sensitive receivers are generally located from 200 to more than 500 feet from the New Whatcom site; new onsite receivers created as part of the New Whatcom development may be in close proximity to certain phases of construction.

Although it is assumed that the construction efforts will be temporary and would not constitute a noise impact, pile-driving is expected to impact the largest number of receivers on and surrounding the project site. Pile-driving would be intermittently intrusive throughout the construction period and could interfere with face-to-face or telephone conversations and disrupt day sleepers and work that requires intense concentration at distances less than 500 feet from the construction area. This may result in the greatest impact to newly created receivers on the New Whatcom site that could be located adjacent to development areas under construction. However, depending on the specific construction activity, these distances could increase or decrease, thus affecting the level of noise that could be received at any given receiver within the study area.

Alternative 1 (Higher Density Alternative)

The redevelopment of Alternative 1 would involve the construction of the most extensive infrastructure, roadway, and utility systems. For this reason, Alternative 1 presents the greatest potential for construction-related noise impacts throughout the project duration. Alternative 1 calls for the development of approximately 7.5 million square feet of total floor space for mixed-use redevelopment. Major roadway infrastructure projects assumed to be completed under Alternative 1, and phased through 2026 include:

- Upgrading C Street, F Street, and Hilton Avenue to improve access to Area 1
- Upgrading Laurel Street between Cornwall Avenue and the Whatcom Waterway
- Extending Commercial Street to Oak Street
- Extending Cornwall Avenue to Area 10
- Upgrading the Central Avenue Wharf
- Extending Central Avenue to Laurel Street

- Building Maple Street through Area 2
- Extending Bay Street to Laurel Street
- Constructing the Broadway Pedestrian Connection
- Completing potential bridge access to the site located at Bay, Laurel, Cornwall, and Commercial
- Constructing the Wharf Street Flyover
- Potentially constructing a pedestrian bridge over the Whatcom Waterway.

From a noise perspective, however, the combination and timing of the onsite roadway improvements among the redevelopment alternatives (Alternatives 1 through 3) do not pose significant differences and have limited ability to significantly impact the existing study area receivers that are located more than 500 feet from a given site being constructed at any given time. It is assumed that most construction noise will fall to levels within 55 to 75 dBA at 500 feet from roadway or general building construction. These construction noise levels would not be considered a significant impact during daytime hours. Noise from impact-related construction activities such as pile-driving, however, will be heard by receivers at a greater distance from the site and are expected to be a nuisance for onsite and offsite receivers. As shown in Table 6, noise from pile-driving typically reaches 106 dbA at 50 feet. Extrapolating the construction noise attenuation factor of 6 dBA, pile-driving may reach 88 dBA at 500 feet. Receivers at this distance, or louder noise levels for those receivers located closer than 500 feet, will experience a substantial noise increase during pile-driving activities.

It is assumed that the new roadway connections to the existing City street network at the perimeter of the site would pose the greatest potential for short-term construction impacts to the existing sensitive receivers due solely to the proximity of sensitive receivers. These localized improvements within the existing City roadway network include:

- Improvements at Central Avenue to allow access to Chestnut Street (Area 2)
- New bridge connection at Bay Street (Area 2)
- New bridge connection at Commercial Street (Area 5)
- New bridge connections at Cornwall Avenue and Laurel Street (Area 7)
- New flyover at Wharf Street to provide connection to the intersection of North State Street and North Forest Street (Area 9).

The above-noted roadway improvements have the greatest potential to impact the existing sensitive receivers in the area. However, as these improvements will be phased over the long term and will be temporary in nature, only short-term construction impacts will result and are not expected to be significant. Further, specific details of the bridge connections at Bay Street, Commercial Street, and Cornwall Avenue/Laurel Street and the Wharf Street Flyover are not anticipated to be included as elements of the Planned Action Ordinance, and may require further environmental review in the future, including potentially noise analyses.

Alternative 3 (Lower Density Alternative)

Alternative 3 represents the lowest level of density, infrastructure, and amenities of the redevelopment alternatives. Alternative 3 calls for the development of approximately 4.0 million square feet of total floor space for mixed-use redevelopment.

Many of the major infrastructure projects to be completed under Alternatives 1 or 2, such as bridge connections or the Wharf Street Flyover, will not be completed under Alternative 3. Additionally, the railway in Alternative 3 would remain in its current alignment, requiring significantly less construction activity.

Removing the construction activities associated with the Laurel Street Bridge and the Wharf Street Flyover would lessen the amount of construction activity near existing sensitive receivers in the east and south study area. Alternative 3 is expected to have the fewest short-term construction impacts, and they are not expected to be significant.

Alternative 4 (No Action Alternative)

The No Action Alternative calls for anticipated industrial growth if the proposed actions are not approved. Alternative 4 estimates development of approximately 1.1 million square feet of new industrial uses plus the reuse of existing space on the New Whatcom site. Limited infrastructure development would also occur, but it is assumed that no other new parks or amenities would be constructed.

In relationship to the rest of the redevelopment alternatives, Alternative 4 is expected to have the least construction-related impact on noise.

Operational Impacts

Non-Traffic Noise

Onsite Considerations

All redevelopment alternatives, including the No Action Alternative, provide for a variety of uses onsite that are expected to contribute some form of noise. These sources, such as, railroad activity, marine terminal use, light industrial business, and water recreation, all can be considered part of the existing, ambient noise environment that is typical of an urban, waterfront community and are expected to increase as a result of the New Whatcom redevelopment. Marine vessels also contribute background noise to the existing area. Under all redevelopment alternatives, large marine vessel traffic is expected to decrease and small, recreational boat traffic is expected to increase (Appendix I). Although the specific changes in noise levels are not known, this change is expected to result in no net increase in noise or a perceived decrease for those who are not in a direct line of sight of the marine vessel traffic, such as the new marina.

Other background noise sources, such as the railroad activity, are expected to continue to contribute to the background noise within the study area. Officials at BNSF have indicated that the rail industry traffic in the Bellingham area is expected to increase minimally. This minimal increase in rail traffic is expected to increase the frequency by one to two round-trip trains per day (Fishman, 2007). Three of the four redevelopment alternatives assume that a portion of the current railroad corridor on the site will be relocated to the eastern and southern border of the site; Alternative 1 and Alternative 2 assumes the relocation of the railroad corridor by 2016; the railroad would be moved by 2026 under Alternative 2a. Under Alternatives 1, 2 and 2a, a portion of the railway would move approximately 500 feet to the east and south. This relocation will position the rail line adjacent to the bluff, similar to the current configuration near the north and south ends of the New Whatcom area. This relocation will serve to decrease noise to future onsite sensitive receivers by moving the noise source away from planned redevelopment activities.

The design of the mixed-used redevelopment will include a variety of noise-generating sources, such as light industrial businesses and ongoing operational activities at the marine shipping terminal. These noise sources will occur within areas that could also support commercial, recreational, and residential uses. Given the potential proximity of new onsite receivers to industrial sources, potential noise issues should be considered as part of the Master Development Plan and future permitting processes. Although future building locations and/or specific noise-generating tenants are not yet known, some specific site planning, design, building orientation, or building techniques could be used to ensure that future noise levels will adhere to the WAC Environmental Noise Regulations. Further, noise-reducing strategies could be especially important where sensitive receivers may be in close proximity to potentially intrusive noise sources such as industrial uses, busy roadways, or the railroad (see discussion of traffic noise below). In order to create a mixed-use redevelopment that does not cumulatively create background noise levels that are potentially incompatible to future sensitive receivers, a number of general physical design methods could be incorporated to promote a long-term, noise-compatible project. These design and construction methods could include any or all of the following:

- Specific acoustical site planning that uses the arrangement of buildings to minimize the potential noise impacts. This could include positioning residential units with a greater setback from busy roadways or other noise-generating sources, and/or in close proximity to quieter and less traveled onsite roadways, or planned parks and greenspaces.

- Incorporate acoustical architectural noise-reducing concepts in the details of individual buildings. These concepts could include room arrangement, window placement, and balcony and courtyard design. For example, placing bedrooms and living rooms in the part of the building that is farthest from the noise source while kitchens and bathrooms are placed closer to the noise source.

- Acoustical construction is a building construction treatment of the various parts of a building to reduce interior noise impacts. It could include the use of walls, windows, doors, ceilings, and floors that have been treated to reduce sound transmission into a building. The use of dense materials and the use of airspaces within materials are the principal noise-reduction techniques of acoustical construction.

- Place non-living unit buildings (such as garages, commercial buildings, and recreational facilities) between the residences and roadways or other noise-generating sources such as industrial projects or the railroad.

Offsite Considerations

The existing and future industrial activities, commercial, residential, and recreational facilities assumed for the New Whatcom site are not expected to impact offsite sensitive receivers. However, effects resulting from the railway relocation would be varied depending on the specific offsite sensitive receiver proximity and orientation to the railroad track. Because only a portion of the rail line will be relocated, it is expected that residences located near Laurel Street near Redevelopment Areas 5 and 7 may be the only receivers that notice an increase in train noise. By relocating the rail line adjacent to the bluff, this move is expected to increase the noise for the first row of sensitive receivers that are positioned closest to the railroad on top of the bluff. However, due to natural sound attenuation against steep terrain, the repositioning of the railroad next to the bluff may reduce the noise at receivers beyond the first row. Additionally, the noise from trains has been contributing to the background noise environment to which all receivers within the study area are already accustomed.

This analysis did not consider specific noise levels generated by the current or future railroad operations; however, the existing operation of the rail line immediately adjacent to some of the receivers at the north and south ends of the site has not resulted in any reported noise concerns or known impacts. Further, railroad corridors are typically located within urban areas in direct proximity to sensitive receivers. Therefore, moving the rail line to the eastern and southern portion of the project site is not anticipated to result in any significant impacts. The railroad corridor relocation, however, would be subject to a specific permitting and environmental review process that could be undertaken by BNSF/WSDOT in the future. A review of noise is likely to be part of that environmental process.

Traffic Noise

Following a review of the traffic volume forecast for each of the redevelopment options, two of the redevelopment alternatives were modeled with the TNM software. It was determined that differences in PM peak traffic volumes for 2016 and 2026 among all the alternatives would not produce an audible difference in the expected future noise within the study area. For purposes of this report, Alternative 1, Alternative 3, and the No Action Alternative were modeled to provide a comprehensive overview of expected "worst-case" future noise levels. Both onsite and offsite future traffic noise has been considered in this evaluation.

Offsite Considerations

Results of the expected future noise levels for existing sensitive receivers, as shown on Figure 1, are presented in Table 7 below.

Table 7
FUTURE TRAFFIC NOISE PREDICTION

			Alt 1		Alt 3		No Action	
Receiver	Description	Existing	2016	2026	2016	2026	2016	2026
RM1	Ground floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	71	72	72	71	72	71	71

Receiver	Description	Existing	Alt 1		Alt 3		No Action	
			2016	2026	2016	2026	2016	2026
R2	Second floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	71	71	72	72	72	71	71
R3	Third floor condominium along West Holly Street; frequent outdoor area faces Roeder Avenue	71	71	72	72	72	71	71
RM4	Residential home on north side of West Holly Street. Frequent outdoor area faces West Holly Street	67	68	69	68	69	68	69
RM5	Public Park, north side of West Holly Street	67	68	69	68	69	68	68
R6	Commercial District near intersection of West Holly Street and Cornwall Avenue	71	71	72	71	72	71	72
R7	Second floor residential condominium along Railroad Avenue; frequent outdoor area faces New Whatcom site	60	63	65	63	64	63	63
R8	Third floor residential condominium along Railroad Avenue; frequent outdoor area faces New Whatcom site	60	63	65	63	64	63	63
R9	Second floor residential condominium along North State Street; frequent outdoor area faces North State Street	71	70	70	70	70	70	70
R10	Third floor residential condominium along North State Street; frequent outdoor area faces North State Street	70	70	70	70	70	70	70
RM11	Ground floor condominium or home adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	73	73	74	73	73	73	73

Receiver	Description	Existing	Alt 1		Alt 3		No Action	
			2016	2026	2016	2026	2016	2026
RM12	Second floor condominium adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	72	72	74	72	72	72	72
R13	Third floor condominium adjacent to Boulevard Street; frequent outdoor area faces New Whatcom site	72	72	73	72	72	72	72
R14	Redevelopment Area 1	NA	70	70	69	70	69	69
R15	Redevelopment Area 2 and 3	NA	58	63	53	60	NA	NA
R16	Redevelopment Area 6 and 8	NA	60	66	60	61	NA	NA

RM # Field-measured and TNM-modeled receiver.
RM # TNM-modeled receiver.
NA = Not analyzed.

As shown in Table 7, based on PM peak, worst hourly traffic volumes, noise levels at most receivers within the surrounding study area currently exceed the Noise Abatement Criteria (NAC). With the exception of the first-row residential receivers located adjacent to Redevelopment Areas 5 and 7, and represented by receivers 7 and 8, noise level increases through 2016 and 2026 would be generally limited to 1 to 2 dBA with or without the New Whatcom Redevelopment. This 1 to 2 dBA increase is predicted for the residential receivers at the north and south ends of the study area, the existing park along West Holly Street, and commercial sites of the downtown area alike.

The greatest noise increases will result at receivers R7 and R8, which range from a 3 to 6 dBA increase during the PM peak hour. These receivers represent high-density residential units located near Redevelopment Areas 5 and 7. These units are in the closest proximity to the New Whatcom site and planned roadway improvements designed to improve access to the site.

A 10-dBA increase above the existing noise environment is considered a substantial increase resulting in a significant impact; as discussed in the Noise Terminology section, a change of 1 dBA cannot be perceived and a 3-dBA change is considered a just-perceivable difference. None of the receivers within the study area would be expected to experience a significant impact in relation to existing noise levels, and with the exception of sensitive receivers represented by receivers R7 and R8, noise increases are not expected to be audible.

Additionally, the noise levels represented by this study are reflective of a worst-case scenario during PM peak hours. Noise levels are expected to reduce during non-peak hours of the day and night.

Because noise levels at receivers within the study area surrounding the project site are currently dominated by the vehicular traffic on the immediately adjacent roadways (such as West Holly Street and North State Street, both of which will not be altered as part of the planned project), mitigation for noise levels greater than the FHWA/WSDOT impact criteria is not warranted.

<u>Onsite Considerations</u>

In order to characterize potential future noise levels within the site, where currently sensitive receivers are mostly limited to industrial employees, new receivers within the proposed redevelopment areas were considered in the traffic noise modeling effort. Because specific design features that may limit exposure of sensitive receivers to noise-generating sources, or buildings and structures that may provide noise attenuation, have not yet been designed, onsite receivers were placed at 50 feet from the busiest roadway within the redevelopment areas to characterize the potential noise levels within the project site due to traffic. Additionally, the TNM noise model can incorrectly predict traffic noise levels at a distance closer than 50 feet without field-collected data of existing conditions to validate the results. As the planned roadways for the New Whatcom redevelopment alternatives do not currently exist, validation of the model for future planned roadways was not possible. In order to remove the most uncertainty, a distance of 50 feet from the future roadways was selected. These onsite receivers are shown on Figure 3.

Onsite noise levels are generally expected to meet the NAC throughout the redevelopment areas, due mainly to the lower volume of vehicles as compared to the surrounding roadways. Receiver 14 represents sensitive receivers within Redevelopment Area 1. However, like all the receivers, the PM peak volumes were modeled to represent a “worst-case” scenario. The predicted noise estimate for receiver R14 indicates a future noise level greater than the FHWA/WSDOT NAC for residential receivers during PM peak hours. However, this location is also subject to traffic noise along Roeder Avenue and the acceleration and deceleration of vehicle turning movements along the roadway. This worst-case noise prediction estimate provides useful data for the future specific design of certain buildings at the New Whatcom site. Because traffic noise attenuates at 3 to 5 dBA with the doubling of distance from the source, specific siting of residential receivers away from the busiest roadways within the

New Whatcom site could reduce noise levels 4 to 10 dBA from the predicted levels shown for receivers R14, R15, and R16.

Alternative 1 (Higher Density Alternative)

Alternative 1 provides for the most intensive changes to the roadway infrastructure. The development of Cornwall Avenue and the Laurel and Bay Street Bridges would increase the travel and distribution of traffic within the site and surrounding downtown areas. Traffic within the new roadway network would not be expected to pose significant impacts to existing sensitive receivers within the area due mainly to the distance between the roadways (more than 500 feet) and the existing receivers. Because a doubling of the traffic volume is required to increase noise 3 dBA, the relatively small change in vehicle traffic from any of the action or no action alternatives does not pose a potential for significant changes in the traffic noise source. Development of the roadway and related infrastructure of the project, and operational impacts resulting from the land uses completed during the initial phase, would provide for a relatively small contribution to the increase in noise within the study area. Generally, increases of 1 to 2 dBA are expected; however, this increase will not be audible by residents within the area. Slightly greater increases of 3 to 6 dBA are expected near the development of the Laurel Street Bridge and Cornwall Avenue (Redevelopment Areas 5 and 7). This increase is expected to be audible but is not considered a significant impact.

One of the few differences between Alternative 1 and Alternative 3 that may result in different noise levels between the build alternatives is the development of the Wharf Street/State Street Flyover and roundabout. Currently, these roadways operate as two intersections. The Wharf Street project would create one intersection controlled by a roundabout, which could result in improved noise levels within the immediate vicinity by decreasing the number of vehicles that must come to a complete stop before accelerating through the area. However, because the details of the Wharf Street project are not known at this time, this improvement is not anticipated to be included as an element of the Planned Action Ordinance, and may require further environmental review in the future, including potentially noise analyses.

Although noise from traffic within the study area is expected to increase under Alternative 1, the audible increases are expected to be limited to those areas in close proximity to Redevelopment Areas 5 and 7. All existing receivers will not experience significant impacts.

Alternative 2 (Medium Density Alternative)

Although Alternative 2 was not modeled with the TNM software, the traffic volumes of the higher-density alternative (Alternative 1) and the lower-density alternative (Alternative 3) were modeled. The differences in the higher- and lower-density models show that typical noise levels are expected to be the same or less than 1 dBA difference between each of the redevelopment options. None of the options will result in a significant impact and, furthermore, the difference between any of the redevelopment options will not be audible.

Alternative 3 (Lower Density Alternative)

Alternative 3 provides the lowest density development of all the redevelopment actions. However, because the differences in expected traffic volumes are marginal from an acoustical standpoint, the expected traffic noise resulting from the development of Alternative 3 would be similar to the expected noise under Alternative 1 and the No Action Alternative.

Background noise, associated with moving the railway closer to receivers in Redevelopment Areas 5 and 7 in Alternatives 1 and 2, will not increase under Alternative 3 as the railroad corridor is not expected to be relocated. As with the higher-density redevelopment actions, no significant impacts are anticipated.

No Action Alternative

Under the No Action Alternative, similar noise levels (within 1 to 2 dBA of existing) are expected throughout the study area due to the similar traffic volumes associated with the general growth within the region, with or without the project.

The increase in industrial activities has the potential to include stationary industrial noise sources; however, under the No Action Alternative it is assumed that each of the industrial operations will obtain and comply with all necessary environmental noise regulations and that there will be no significant noise impacts to onsite or offsite receivers.

MITIGATION MEASURES

Construction Mitigation

Construction of the New Whatcom Redevelopment is expected to be phased over the long term. Phased construction will provide for intermittent construction efforts that result in short-term noise increases. Although the construction efforts are considered short-term and are exempt from specific permitting requirements, some best management practices could be implemented to help reduce the impacts to onsite and nearby receivers.

Construction noise could be reduced by providing mufflers on engines, using quieter equipment or construction practices, and turning off equipment when not in use. To reduce construction noise at nearby receivers, construction industry best management practices would be incorporated into construction plans and contractor specifications. The Redevelopment could also include the following construction noise mitigation measures:

- Limiting construction activities during weekends to comply with the Bellingham Municipal Code noise regulations and restricting construction noise to the hours between 7:00 AM and 10:00 PM within residential areas (BMC 10.24.120).

- Explore the feasibility of using less noisy alternatives to pile-driving. For example, predrilling a pile hole using an auger to place the pile at or near its design depth would reduce noise levels by 5 to 10 dBA. In addition, limits on specific construction times could be designated for pile-driving activities.

- Equipping the engines of construction equipment with adequate mufflers, intake silencers, or engine enclosures that would reduce their noise by 5 to 10 dBA (EPA, 1971).

- Turning off construction equipment when not in use for long periods.

- Requiring contractors to maintain all equipment and training their equipment operators to reduce noise levels.

- Locating stationary equipment away from receiving properties to decrease noise, as much as feasible.

Operational Mitigation

Based on WSDOT's NAC, noise abatement measures should be considered when the predicted noise levels approach or exceed those values presented in Table 2 for projects that involve construction of a new roadway, altering the horizontal or vertical alignment of an existing roadway or adding through lanes. Other offsite roadway improvements are not assumed as part of the Redevelopment Alternatives (such improvements would likely be required as mitigation for transportation impacts). Further, the proposed new bridge connections and the Wharf Street Flyover are not considered part of the Planned Action Ordinance and will be subject to separate permitting actions and environmental review in the future, including noise impacts.

The predicted future traffic noise levels on the project site are considered a worst-case scenario and can be used to specifically site and design adjacent residential land uses that could reduce the potential for any noise levels above the NAC or the WAC Environmental Noise Levels. These design and construction methods could include any or all of the following:

- Specific acoustical site planning that uses the arrangement of buildings to minimize the potential noise impacts. This could include positioning residential units with a greater setback from busy roadways or other noise-generating sources, and/or in close proximity to quieter and less traveled onsite roadways, or planned parks and greenspaces.

- Incorporate acoustical architectural noise-reducing concepts in the details of individual buildings. These concepts could include room arrangement, window placement, and balcony and courtyard design. For example, placing bedrooms and living rooms in the part of the building that is farthest from the noise source while kitchens and bathrooms are placed closer to the noise source.

- Acoustical construction is a building construction treatment of the various parts of a building to reduce interior noise impacts. It could include the use of walls, windows, doors, ceilings, and floors that have been treated to reduce sound transmission into a building. The use of dense materials and the use of airspaces within materials are the principal noise-reduction techniques of acoustical construction.

- Place non-living unit buildings (such as garages, commercial buildings, and recreational facilities) between the residences and roadways or other noise-generating sources such as industrial projects or the railroad.

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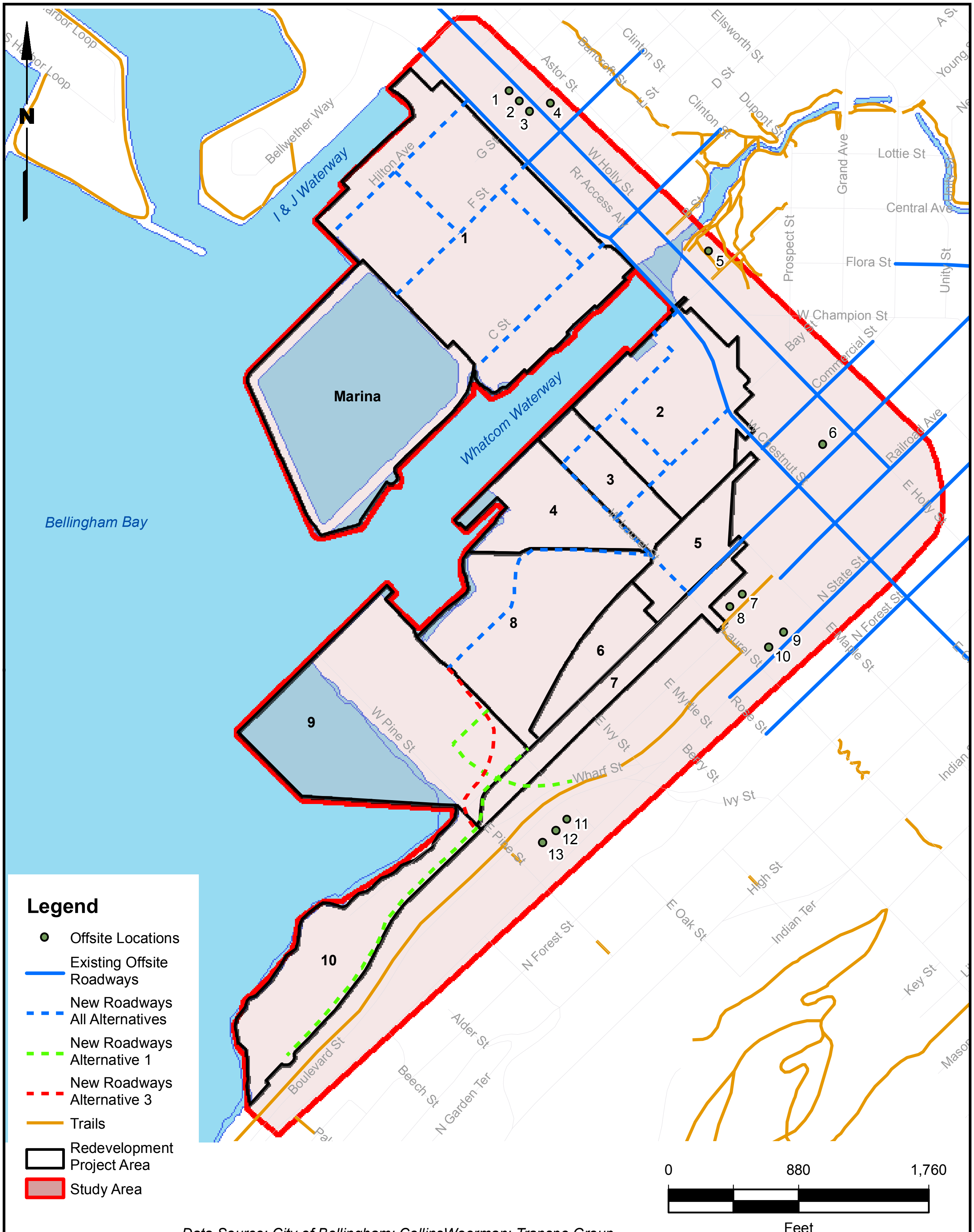
ATTACHMENTS

Figure 1: Noise Study Area and Existing Receivers
Figure 2: Construction Noise Attenuation with Doubling of Distance
Figure 3: Noise Study Area and New Onsite Receivers



Data Source: City of Bellingham; CollinsWoerman; Transpo Group

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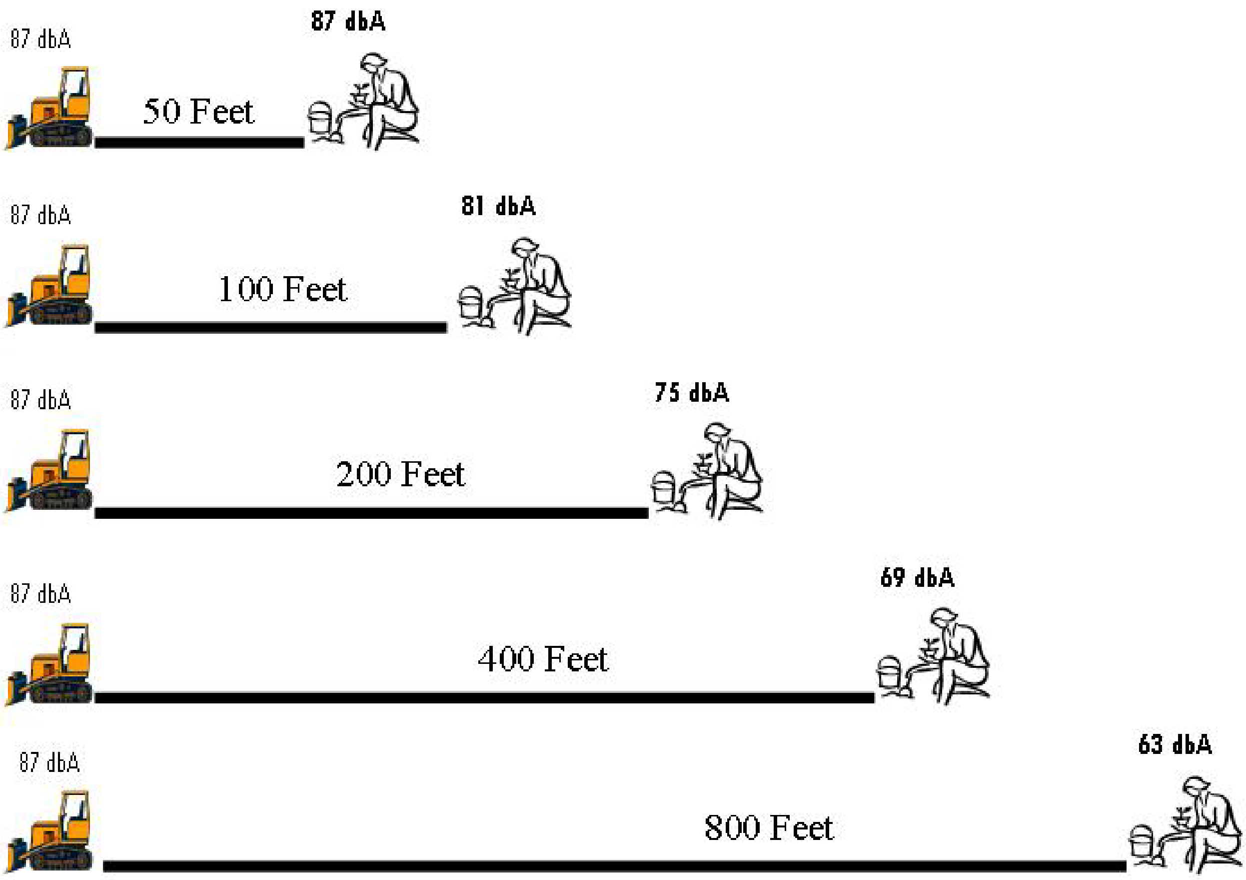
Landau Associates

New Whatcom Redevelopment Bellingham, Washington	**Noise Study Area and Existing Receivers**	Figure 1

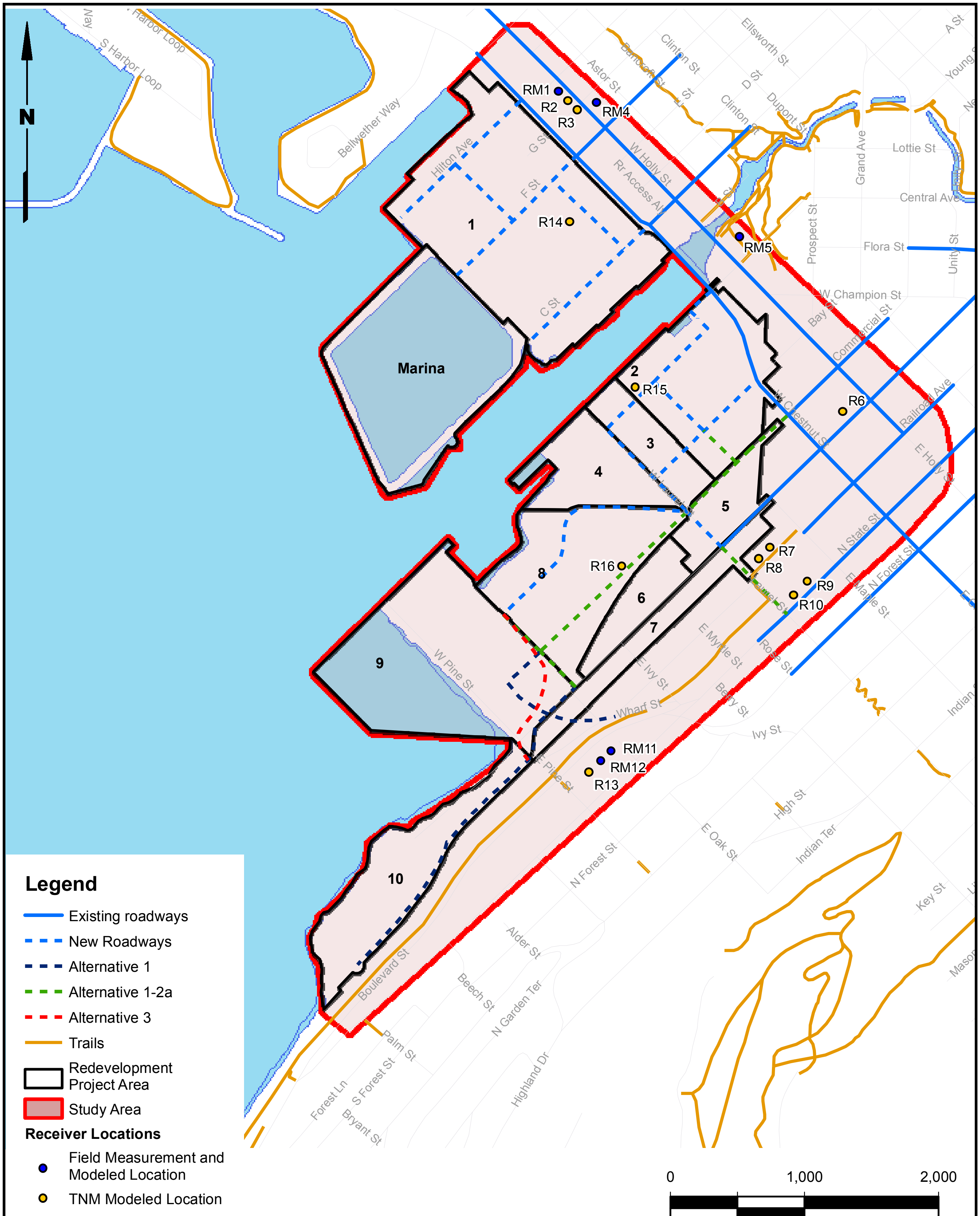


Landau Associates

New Whatcom Redevelopment
Bellingham, Washington

Construction Noise Attenuation With Doubling of Distance

Figure 2



Data Source: City of Bellingham; Collins Woreman; Transpo Group

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LANDAU ASSOCIATES

New Whatcom Redevelopment Bellingham, Washington	**Noise Study Area and Receivers**	Figure 3