4.10 NOISE

Section 4.10 provides a detailed description of the existing noise environment at the Tesoro Avon Marine Oil Terminal (Avon Terminal) Lease Consideration Project (Project) study area, identifies nearby sensitive receptors, and describes potential impacts that may be associated with continued operation of the Avon Terminal and Marine Oil Terminal Engineering Maintenance Standards (MOTEMS) compliance-related renovation. Applicable regulations of the local community are also discussed. For purposes of discussion, a brief description of the generation and characteristics of sound, and how sound is measured, is also provided.

4.10.1 CONCEPTS AND TERMINOLOGY

4.10.1.1 Terminology

This noise analysis relies on the following standard noise-related terms and principles.

- **Environmental noise:** Environmental noise is defined as unwanted sound resulting from vibrations in the air. Excessive noise can cause annoyance and adverse health effects. Annoyance can include sleep disturbance and speech interference. It can also distract attention and make activities more difficult to perform (U.S. Environmental Protection Agency [USEPA] 1978).
- The range of pressures that create noise is broad. Noise is, therefore, measured on a logarithmic scale, expressed in **decibels (dB)**. Noise is typically measured on the **A-weighted scale (dBA)**, which has been shown to provide a good correlation with human response to sound, and is the most widely used descriptor for community noise assessments (Harris 1998).
- To describe the time-varying character of environmental noise, various statistical noise descriptors are typically used.
  - **L_{max}**: L_{max} is the maximum noise level generated by a source at a specified distance.
  - **L_{eq}**: L_{eq} is the equivalent noise level over a specified period of time (i.e., one hour). It is a single value of sound that includes all of the varying sound energy in a given duration.
  - **L_{90}, L_{50}, and L_{10}**: These are the A-weighted sound levels that are exceeded at the specified percentage of time. For example, L_{90} is the sound level exceeded 90 percent of the time and is often considered the background, or residual, noise level. Similarly, L_{10} is the sound level exceeded 10 percent of the time and is commonly used as a measurement of intrusive sounds, such as aircraft overflight.

- **L_{dn}:** L_{dn}, or day-night noise level, is the A-weighted sound level over a 24-hour period, with an additional 10 dB penalty imposed on sounds that occur between 10 p.m. and 7 a.m.
- **CNEL:** CNEL, or Community Noise Equivalent Level, is similar to L_{dn} and is the A-weighted sound level over a 24-hour period, with an additional 10 dB penalty imposed on sounds that occur between 10 p.m. and 7 a.m., and 5 dB penalty imposed on sounds that occur in the evening between 7 p.m. and 10 p.m. CNEL was developed in California for evaluating noise levels in residential communities. CNEL will always be higher than L_{dn} for the same location; therefore, it is appropriate and conservative to use CNEL when L_{dn} is not available or when comparing calculated noise to an L_{dn} threshold.

4.10.1.2 General Noise Concepts

Sound travels through the air as pressure waves caused by some type of vibration. In general, sound waves travel away from a noise source at ground level in a hemispherical pattern. The energy contained in a sound wave is spread over an increasing area as it travels away from the noise source. Typical A-weighted noise levels for various sound sources are summarized in Table 4.10-1.

The nature of dB scales is such that individual dB ratings for different noise sources cannot be added directly to give the sound level for the combined noise from all sources. Instead, the combined noise level produced by multiple noise sources is calculated using logarithmic summation. For example, if one source produces a noise level of 80 dBA, then two of the identical sources side by side would generate a combined noise level of 83 dBA, or an increase of only 3 dBA.

People generally perceive a 10 dBA increase in a noise source as a doubling of loudness. Also, most people cannot detect differences of less than 2 dBA between noise levels of a similar nature, while most could probably perceive a change of approximately 5 dBA. When a new intruding sound is of a different nature than the background sound, such as a horn sounding in heavy vehicle traffic, most people can detect changes as low as 1 dBA. When distance is the only factor considered, sound levels from isolated point sources of noise are reduced by approximately 6 dBA for every doubling of distance. The following formula can also be used to determine noise reduction at any distance from an isolated point source:

$$L_2 = L_1 - (20 \times \log_{10}(r_2/r_1)$$

Where: L_1 is the noise level at reference distance (r_1)

L_2 is the noise level at receptor distance (r_2)

When the noise source is on a continuous line, such as vehicle traffic on a highway, sound levels decrease by approximately 3 dBA for every doubling of distance.

Noise levels can also be affected by several factors other than distance. Topographic features and structural barriers absorb, reflect, and scatter sound waves and affect the reduction of noise levels. Atmospheric conditions (wind speed and direction, humidity, and temperature) and the presence of dense vegetation can also affect the degree to which sound waves are attenuated over distance.

Table 4.10-1: Typical A-weighted Sound Levels

Sound Source	Sound Level (dBA)	Typical Human Response
Aircraft Carrier deck jet operation	140	Painfully loud
Limit of amplified speech	130	
Jet takeoff (200 feet) Auto horn (3 feet)	120	Threshold of feeling and pain
Jet takeoff (2,000 feet) Riveting machine	110	Very annoying
Shout (0.5 feet) New York subway station	100	
Heavy truck (50 feet) Pneumatic drill (50 feet)	90	Hearing damage (8-hour exposure)
Passenger train (100 feet) Helicopter (in flight, 500 feet) Freight train (50 feet)	80	Annoying
Freeway traffic (50 feet)	70	Intrusive
Air conditioning unit (20 feet) Light auto traffic (50 feet)	60	
Normal speech (15 feet)	50	Quiet
Living room Bedroom Library	40	
Soft whisper	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

Source: Compiled by TRC

4.10.2 ENVIRONMENTAL SETTING

4.10.2.1 Noise Characteristics of the Project Area

The Avon Terminal is located in lower Suisun Bay east of the Benicia-Martinez Bridge. Nearby industrial facilities include the Shell Refinery to the west, the Plains Product Terminal (Plains Terminal) to the west, and the Tesoro Refining and Marketing Company, LLC (Tesoro) Golden Eagle Refinery (Refinery) to the southeast. Noise in the Project area is derived primarily from existing Avon Terminal operations and mobile sources associated with the bridge (road traffic, railroad) and strait (vessel traffic). Secondary noise sources include industrial activities at the Plains Terminal and the Shell and Golden Eagle Refineries. These sources contribute to the ambient noise environment at the receptor location, and would remain unchanged by the proposed lease renewal.

Field noise monitoring was conducted at the nearby Tesoro Amorco Marine Oil Terminal (Amorco Terminal; CSLC 2014a) to determine the existing noise level during typical operation activities (see Figure 4.10-1). These data are considered to be similar to operational noise levels that occur at the Project site.

The noise measurements were taken between 5:30 p.m. and 7 p.m. on Thursday, August 1, 2013, associated with the docking and unloading of the ship NISSOS KYTHNOS. The noise measurement period included inactivity prior to ship arrival, approach and docking of the ship, and the crude oil offloading process.

The noise monitor was set up on the berth, approximately at the midpoint of the berth. A RION NA-27 integrating sound-level meter with an integral data logger, meeting the IEC651:1979/IEC804:1985 requirements for precision Type 1 sound-level meters, was used. The meter was calibrated at the beginning and at the end of each measurement with a Bruel & Kjaer Model 4231 sound-level calibrator.

The L_{eq} varied from 54.4 dBA to 61.8 dBA over the monitoring period. L_{max} levels were recorded as high as 78.7 dBA, but these were observed to be attributable to sources outside the Project area, such as airplanes, trains, and vehicles on the bridge. Based on the noise measurement data collected and observations of monitoring personnel, noise in the area did not vary substantially before, during, or after the docking and unloading process, and no individual sources of increased noise attributable to Amorco Terminal activities were discernible (TRC 2013).

Figure 4.10-1
Noise Monitoring and Receptor Locations
California State Lands Commission
Avon Marine Oil Terminal Lease Consideration Project

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

4.10.2.2 Sensitive Receptors

There are no sensitive receptors or sensitive land uses (i.e., hospitals, schools, nursing homes) located near the Avon Terminal. The nearest residences (referred to for the purposes of this noise analysis as the "residential receptor location") are located along Donna Drive and Irene Drive in unincorporated Contra Costa County, approximately 2.1 miles south of the Avon Terminal Berth 1 and 1.4 miles south of Bent 328 in Area A of the approachway, which is the closest renovation area associated with the Project.

The residential receptor location and its proximity to the Avon Terminal are shown on Figure 4.10-1. As seen on Figure 4.10-1, industrial (including the Plains Terminal and the Refinery) and railroad facilities exist between the Avon Terminal and the residential (R-1) receptor, which would generally contribute more noise at the receptor location than the Avon Terminal. Figure 11-5C in Section 11 (Noise Element) of the *Contra Costa County General Plan* (2005) indicates that the receptor location is currently in an area impacted by noise primarily from Highway 680, with an ambient noise level of 65 dBA L_{dn}.

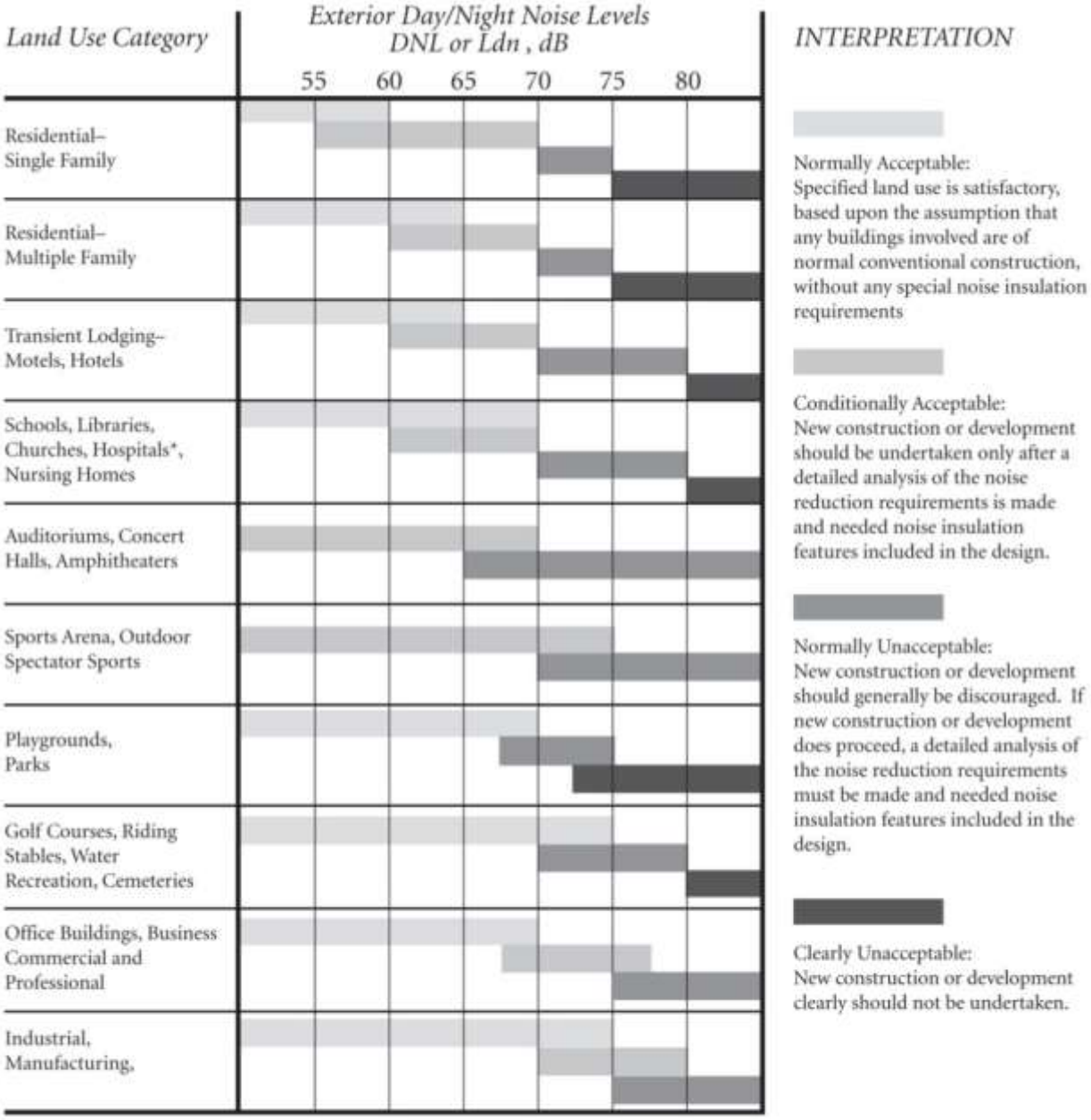
4.10.3 REGULATORY SETTING

Federal and State laws that may be relevant to the Project are identified in Table 4-1. Local laws, regulations, and policies are discussed below.

Section 11 (Noise Element) of the *Contra Costa County General Plan* (2005) establishes, in Policy 11-1, the acceptability of proposed new land uses within existing noise-impacted areas, in accordance with the State of California General Plan Guidelines, shown in Table 4.10-2. This table can also be used to determine if receptors within a current land use area would be significantly impacted by a proposed new land use in the vicinity. The maximum exterior noise level considered to be "normally acceptable" for single-family residential uses is 60 dBA L_{dn}, and noise levels of up to 70 dBA L_{dn} are considered to be "conditionally acceptable." The maximum exterior noise level considered to be "normally acceptable," without condition, for industrial uses is 70 dBA L_{dn}. This policy does not apply to temporary noise levels, such as from construction.

Noise Element Policy 11-8 states that construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses, and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods.

Table 4.10-2: Noise Level/Land Use Compatibility



Source: Office of Planning and Research, State of California General Plan Guidelines, Appendix A: Guidelines for the Preparation and Content of the Noise Element of the General Plan, 1998.

*Because hospitals are often designed and constructed with high noise insulation properties, it is possible for them to be satisfactorily located in noisier areas.

4.10.4 SIGNIFICANCE CRITERIA

For the purposes of this analysis, an impact was considered to be significant and require mitigation if, as a result of the Project, it was determined that the following would occur:

- A violation of local noise ordinances or any other exceedance of applicable noise standards in regulations promulgated at the county, State, or federal level. The lowest applicable noise level criteria is as follows:
  - Policy 11-1 of the *Contra Costa County General Plan* Noise Element establishes that the maximum unconditional day-night level (L_{dn}) for an industrial land use is 70 dBA (A-weighted sound level).
  - Policy 11-8 of the *Contra Costa County General Plan* Noise Element established that construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day.

Environmental impacts are discussed in this section relative to receptors in the Project vicinity. Potential noise impacts relate to MOTEMS renovation and continued operation of the offshore portion of the Avon Terminal, which is already considered a partial contributor to the ambient noise environment at the receptor location.

4.10.5 IMPACT ANALYSIS AND MITIGATION

The following subsections describe the Project's potential impacts on noise levels at the residential receptor location. Where impacts are determined to be significant, feasible mitigation measures (MM) are described that would reduce or avoid the impact.

4.10.5.1 Proposed Project

Impact Noise (NO)-1: Cause a violation of local noise ordinances or any other exceedance of applicable noise standards in regulations promulgated at the county, State, or federal level. (Less than significant.)

Based on the noise measurement data collected and observations of monitoring personnel (TRC 2013), continued Project operations (i.e., ship docking and loading/unloading process) do not result in a measurable increase in ambient noise at the Project site or in the vicinity, and do not create discernible individual sources of increased noise that would allow the Project to approach the significance threshold of 70 dBA L_{dn}. The existing Project operation noise is considered a partial contributor to the ambient noise environment at the receptor locations, which would remain unchanged by the Project.

During Project renovation, noise would be present from two separate sources: (1) transport of workers, equipment, and material; and (2) use of heavy equipment.

Transportation of workers, equipment, and materials to and from the renovation site, as described in Section 2.5, MOTEMS-related Renovation, would incrementally increase noise levels along public roads leading to the Project location. Although there could be a relatively high single-event noise exposure potential with passing trucks, the increase in overall noise would be minimal when averaged over a 24-hour period.

With respect to heavy equipment operation, noise would be produced during the renovation activities described in Section 2.5, MOTEMS-related Renovation. Typical equipment and anticipated duration of use required for the renovation activities is provided in Table 2-7 in Section 2.0, Project Description.

Composite construction noise has been best characterized by Bolt, Beranek, and Newman (Schultz 1971). Although published more than 40 years ago, this document remains the industry standard for the estimated base noise emissions from construction equipment and associated noise impact analyses, as it is included in the latest construction noise guidance from the Federal Highway Administration (Federal Highway Administration [FHWA] 2006). Further, use of the data is considered to be conservative, since the evolution of construction equipment has been toward quieter designs to protect both operators from exposure to high noise levels and the community from undue noise intrusion. Table 4.10-3 presents noise levels from some common construction equipment proposed for the Project.

Table 4.10-3: Noise Levels from Common Construction Equipment

Equipment	Typical Sound Pressure Level (L_{max}) at 50 Feet (dBA)
Impact pile driver	101
Vibratory pile driver	101
Crane	85
Pickup truck	75
Telehandler	85
Air compressor	80

Source: FHWA 2006

Noise levels during renovation would vary during the different activity periods, depending upon the activity location(s) and the number and types of equipment used. Table 4.10.4 summarizes aggregate noise levels during typical phases of construction.

Table 4.10-4: Standard Construction Equipment Aggregate Noise Emission Values

Typical Construction Phase	Aggregate Equipment Sound Pressure Level at 50 Feet (dBA)
Site clearing	84
Excavation	89
Foundation	77
Building	84
Finishing	89

Source: USEPA 1971

Renovation would generally occur between the hours of 7 a.m. and 7 p.m., Monday through Friday; however, some work may be completed on weekends and/or outside of typical work hours, as necessary. Approximately 15 workers would be employed on a night shift for 4 months. Work at night may include welding, material handling, and construction of temporary access for the pile-driving equipment. Since the night work would not include pile driving or other loud construction noises, and would be short term, noise impacts on sensitive receptors would be less than significant.

Since there is no applicable quantitative regulatory requirement to limit temporary increases in noise levels due to Project renovation activities, the following analysis is meant to provide a general estimate of the renovation noise level that would occur at the receptor locations, and is presented for informational purposes only.

As indicated in Table 4.10-4, the highest aggregate sound levels (89 dBA at 50 feet) are typically associated with the excavation and finishing phases of construction and renovation. These noise estimates are adjusted for time-usage factors and varying power settings, and would not be continuous noise emissions. Renovation noise would vary considerably throughout Project renovation.

The aggregate operation of heavy equipment would result in both steady and episodic noise, which would add to the ambient levels at the nearby residential receptor locations. If a minimum distance of 1.4 miles (7,400 feet) from renovation activities to receptor locations is assumed, receptors would potentially perceive renovation noise of approximately 46 dBA (using the equation presented in Section 4.10.1.2), which would not likely be perceptible to residential receptors. This is a conservative estimate, since the only attenuating mechanism considered is divergence of the sound waves in open air based on distance from the source. Additional noise attenuation would be expected from air absorption, ground effects, and shielding from intervening topography or structures. Since renovation noise would not likely be perceived by the closest receptors, impacts would be less than significant.

Mitigation Measure: No mitigation required.

4.10.5.2 Alternative 1: No Project

Impact NO-2: Effects on noise with no new Avon Terminal lease. (Less than significant.)

Under the No Project alternative, Tesoro's Avon Terminal lease would not be renewed and the existing Avon Terminal would be eventually decommissioned with its components abandoned in place, removed, or a combination thereof. Decommissioning of the Avon Terminal would be governed by an Abandonment and Restoration Plan, and noise generated by demolition and removal would be considered construction noise in conformance with the local ordinance.

After decommissioning, the No Project alternative assumes the number of tankers servicing the area would remain essentially the same due to regional demands, and assumes that without the Avon Terminal, incoming tankers would instead go to the Amorco Terminal or another San Francisco Bay Area marine oil terminal. Since the contribution of the Project to ambient noise conditions at residential receptors was determined to be negligible, decommissioning the facility and shifting tanker traffic to another local facility would not result in a significant increase or decrease in noise in the Project vicinity.

Mitigation Measure: No mitigation required.

Impact NO-3: Effects on noise by transferring product using non-marine sources. (Potentially significant.)

This alternative assumes that there would be no Avon Terminal to transport product and, therefore, Refinery operations would be dependent on non-marine sources to continue to meet existing regional demands and the current throughput from the Avon Terminal. Sources may include land-based transportation such as rail cars and trucks, and/or pipeline connections to other San Francisco Bay Area marine oil terminals, or a combination thereof.

Crude oil transportation by rail car would involve constructing additional rail lines and associated handling facilities. Pipeline delivery would require construction of new pipelines and/or the purchase of existing pipeline capacity from other local petroleum refinery competitors. Construction noise would be in conformance with the local ordinance.

If an increase in rail transportation volume was selected as an alternative means of crude oil transport to the Refinery, there is potential for a significant increase in noise in the vicinity, since rail activity is already a major source of noise in the area and the railroad is located closer to the residential receptor locations.

Construction and operation of such facilities would be subject to substantial environmental review and permitting by local and State agencies.

Mitigation Measures: Should this alternative be selected, MMs would be determined during a separate environmental review under the California Environmental Quality Act (CEQA).

4.10.5.3 Alternative 2: Restricted Lease Taking Avon Terminal Out of Service for Oil Transport

Impact NO-4: Effects on noise by taking Avon Terminal out of service for oil transport. (Beneficial.)

The Avon Terminal is an existing facility and the associated Refinery is on land zoned Heavy Industrial. A reduction in noise levels in the Project area are anticipated as a result of a restricted lease.

Mitigation Measure: No mitigation required.

4.10.6 CUMULATIVE IMPACT ANALYSIS

Continued routine operations at the Avon Terminal would not contribute to cumulative noise impacts. Based on the noise measurement data collected and observations of monitoring personnel (TRC 2013), continued Project operations (i.e., ship docking and loading/unloading process) do not result in a measurable increase in ambient noise at the Project site or in the vicinity, and do not create discernible individual sources of increased noise that would allow the Project to approach the significance threshold of 70 dBA L_{dn}. The existing Project operation noise is considered a partial contributor to the ambient noise environment at the receptor locations, which would remain unchanged by the Project.

No other construction projects are currently planned in the Project vicinity so there would be no cumulative impact from renovation noise.

4.10.7 SUMMARY OF FINDINGS

Table 4.10-5 includes a summary of anticipated impacts to existing ambient sound levels.

Table 4.10-5: Summary of Noise Impacts and Mitigation Measures

Impact	Mitigation Measure(s)
Proposed Project	
NO-1: Cause a violation of local noise ordinances or any other exceedance of applicable noise standards in regulations promulgated at the county, State, or federal level.	No mitigation required
Alternative 1: No Project	
NO-2: Effects on noise with no new Avon Terminal lease.	No mitigation required
NO-3: Effects on noise by transferring product using non-marine sources.	Should this alternative be selected, MMs would be determined during a separate environmental review under CEQA
Alternative 2: Restricted Lease Taking Avon Terminal Out of Service for Oil Transport	
NO-4: Effects on noise by taking Avon Terminal out of service for oil transport.	No mitigation required

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