5.13 ENERGY

5.13.1 Significance Criteria

According to Appendix F of the CEQA Guidelines, project "alternatives should be compared in terms of overall energy consumption and in terms of reducing wasteful, inefficient, and unnecessary consumption of energy." For the purposes of this EIR, an impact would be considered significant if:

- A proposed alternative results in a substantial increase in energy consumption per passenger miles traveled; or
- A proposed alternative would result in a wasteful, inefficient, or unnecessary consumption of energy.

5.13.2 Method of Analysis

This energy analysis addresses the changes in energy consumption by the transportation sector in the nine-county Bay Area for the year 2025 between the four project alternatives. Forecasted energy consumption per PMT was calculated for automobiles, trucks, public buses, transit rail vehicles, and ferries. Ferry energy consumption was calculated using the projected schedule of routes, types of ferries to be used, and passenger volumes. Energy calculations for all other transportation modes were calculated using vehicle miles traveled (VMT) and passenger volume forecasts based on the transportation modeling performed for this project (Outwater 2002).

Comparisons of energy consumption were made between Alternative 4 (No Project) and the other project alternatives to determine the change in total Bay Area-wide transportation energy use with Alternatives 1, 2, and 3. Appendix ENRG-B presents details on the energy consumption per PMT value calculation methodology used for this report.

For this analysis, consumption of energy by ferry vessels was estimated based on engine power output. Engine power output is generally referred to in kilowatts (kW). Power is converted to energy, in the unit of kilowatt-hours (kW-hrs), by applying a factor of engine running time. The energy unit of kW-hrs can directly be converted to a Btu value.

For the no project alternative, average power outputs were assumed for each route, based on the current ferries in use on these routes[1]. Characteristics of the current ferries are available in the working document, *New Technologies and Alternative Fuels*, prepared for Water Transit Authority by JJMA (JJMA 2002). For Alternatives 1, 2, and 3, two ferry fleets were assumed. One fleet would consist of 400-passenger ferries with a maximum power output of 5,966 kW. The other fleet would have 149-passenger ferries with a maximum power output of 2,163 kW (Hutchison 2002). Daily energy consumption per PMT was calculated by dividing the average daily energy consumption by the average daily PMT.

[1] For the Larkspur ferry route, only the newer catamaran vessels used on this route were assumed to be used for the no project alternative. The monohull boats used on this route were constructed in the 1970's and will be taken out of commission by 2025.

5.13.3 Impacts and Mitigation

The following section addresses energy consumption for all transit modes in the Bay Area for all project alternatives and potential mitigation measures.

Impact E-1 **Enhancing or expanding ferry service in the Bay Area would result in more energy consumed per passenger mile traveled for all transit modes in the Bay Area. This increase is relatively small on the regional scale.**

Compared to Alternative 4 (No Project), total daily energy consumption and energy consumption per PMT for all transit modes in the Bay Area would increase for Alternatives 1, 2, and 3. This increase can be summarized as follows:

	Total Energy Consumption (Btu)	Percent Increase in Energy Over Alternative 4	Energy/PMT (Btu/PMT)	Percent Increase in Energy/PMT over Alternative 4
Alternative 1	1,209,281,802,398	0.43%	4,385	0.97
Alternative 2	1,202,356,703,160	0.32%	4,362	0.45
Alternative 3	1,203,393,344,245	0.10%	4,342	0
Alternative 4	1,203,428,264,995	NA	4,342	NA

Alternative 1 would have the largest increase in total transit energy consumption and energy consumption per PMT in comparison to Alternative 4. For all project alternatives, the totals for energy consumption and energy consumption per PMT values are primarily determined by automobiles. Automobiles consume 92 percent of the total energy consumed by the transportation sector in 2025 and 75 percent of the total PMT. Ferries would consume between 0.6 percent and 0.05 percent (depending on the alternative) of the total energy consumed by the transportation sector and between 0.4 percent and 0.09 percent of the total PMT. Although there is an increase in energy use, it is not a substantial or significant increase regionally, as shown above.

Summary of Impact E-1

- Alternative 1 would result in a 0.97 percent increase over Alternative 4 in energy consumption per passenger mile traveled for all transit modes in the Bay Area. This would be a less-than-significant impact.
- Alternative 2 would result in a 0.45 percent increase over Alternative 4 in energy consumption per passenger mile traveled for all transit modes in the Bay Area. This would be a less-than-significant impact.
- Alternative 3 would result in no increase over Alternative 4 in energy consumption per passenger mile traveled for all transit modes in the Bay Area. This would be a less-than-significant impact.
- Alternative 4 would have no impacts.

Mitigation E-1.1: Energy consumption by the ferries under Alternatives 1, 2, and 3 would be further reduced by elimination of routes with low ridership, such that the following routes would remain:

Alameda to San Francisco
Oakland to San Francisco
Tiburon to San Francisco
Richmond to San Francisco
Martinez to San Francisco
Hercules to San Francisco
Harbor Bay to San Francisco
Sausalito to San Francisco
Berkeley to San Francisco
Larkspur to San Francisco
Vallejo to San Francisco
Pittsburg to San Francisco

The table below shows the energy consumption for a ferry service using the above routes:

Total Energy Consumption (Btu)	Percent Increase In Energy Over Alternative 4	Energy/PMT (Btu/PMT)	Percent Increase In Energy/PMT over Alternative 4
1,209,865,172,223	0.53	4,353	0.25

As shown above, this mitigated Alternative 2 ferry service would still result in an increase in energy consumption per PMT over Alternatives 3 and 4, but this mitigated alternative would result in improved passenger service over these two alternatives and improved energy consumption per PMT value over Alternative 1 and an unmitigated Alternative 2. This mitigated alternative demonstrates an improved efficiency in energy use based by focusing proposed new ferry service on routes predicted to have the most passenger demand.

Impact After Mitigation: Energy consumption per PMT values would be improved but remain slightly greater under the above-described mitigated alternative than with Alternative 4. This impact is less than significant as the difference in energy use is not measurably different between Alternative 4 (4,343 Btu/PMT) and Alternative 2 as mitigated above (4,353 Btu/PMT).

Impact E-2 **The proposed enhancement or expansion of ferry service in the Bay Area could result in a wasteful, inefficient, and unnecessary consumption of energy without mitigation.**

The design and purpose of enhancing or expanding the ferry services in the Bay Area is to increase and improve transportation mobility, service, and choice in the Bay Area, provide a service to regional commuters, and provide an additional mode of regional transit in the Bay Area. As discussed in Section 3.12 of this report (Transportation), the major areas of traffic congestion are at the transbay crossings. Alternatives 1, 2, and 3 would result in decreases in daily trips across all the transbay routes for all modes of transbay transit (i.e., BART, AC Transit, highways, etc.). However, ridership at full service is projected to be fairly low in comparison to the potential numbers of people that could be utilizing the ferries (i.e., filling every ferry run at or near the capacity of each ferry). Low average ridership volumes per ferry run would contribute to a high rate of energy consumption per PMT. Comparison of the forecasted average passengers per run and daily PMT values for the ferries to other modes of mass transit in the Bay Area (see Table 5.13.1) shows that Alternatives 1, 2, and 3 would result in a slightly less energy-efficient mode of mass transit.

Summary of Impact E-2

- Alternatives 1, 2, and 3 could result in low passengers per run and PMT values when compared to other forms of regional mass transit in the Bay Area and compared to Alternative 4 (No Project). As shown in Table 5.13.1, the passengers per run and the PMT values are lower for ferries than for the other four modes of mass transit analyzed. Comparison of the passengers per run and PMT values for Alternatives 1, 2, and 3 are lower than Alternative 4. These low passenger per run values are a primary factor for the high energy consumption per PMT values for Alternatives 1, 2, and 3. Therefore, these alternatives could result in potentially significant impacts.
- Alternative 4 would result in vessels averaging approximately 42 percent of their maximum capacity. This alternative represents current conditions. No impact would occur.

Mitigation E-2.1: Energy consumption for the alternatives can be improved by focusing service on the routes with greatest demand, as shown in Mitigation E-1.1.

Mitigation E-2.2: The WTA would continue to investigate the feasibility and applicability of using energy sources other than fossil fuels. The WTA has investigated the use of alternative fuels for ferries in the working document, *New Technologies and Alternative Fuels Working Document*, (JJMA 2002), which is available on the WTA website, www.watertransit.org.. Alternative energy sources would become incorporated and used by the WTA as they become feasible for use with the WTA ferries.

Impact After Mitigation: Consumption of energy is a factor of achieving high-speed ferry service. This transit mode has the potential to approximately match energy consumption per PMT values as other mass transit modes. By implementing Mitigations E-2.1 and E-2.2, this impact would be a less-than-significant impact and would avoid the potential for wasteful or inefficient consumption of energy.

References

Hutchison, B. 2002. Personal communication between Bruce Hutchison of Glosten, Inc. with URS. June.

John J. McMullen Associates, Inc. (JJMA). 2002. New Technologies and Alternative Fuels. Prepared for Water Transit Authority. May 2.

Outwater, Maren. 2002. Personal Communication between Maren Outwater of Cambridge Systematics and URS. June and July.

Table 5.13.1
Comparison of Passenger Data for Mass Transit Modes – Alternatives 1 Through 4

		Passengers/Run	PMT
Alternative 1	Buses	53	17,671,965
	Light Rail	108	2,087,013
	BART	1,041	32,668,803
	Commuter Rail	964	8,199,995
	Ferries	17	984,023
Alternative 2	Buses	56	18,604,195
	Light Rail	110	2,125,606
	BART	1,053	33,052,084
	Commuter Rail	971	8,263,327
	Ferries	21	630,431
Alternative 3	Buses	58	18,927,393
	Light Rail	111	2,129,149
	BART	1,061	33,312,983
	Commuter Rail	981	8,342,568
	Ferries	38	430,074
Alternative 4	Buses	59	18,974,168
	Light Rail	111	2,132,620
	BART	1,062	33,322,155
	Commuter Rail	952	8,099,280
	Ferries	164	236,461

Source: JJMA 2002; Outwater 2002