Appendix I

Low-sulfur Fuel Availability

Availability of Low-Sulfur Marine Distillate Fuels

Marine distillate fuels are fuels that meet the specifications for DMA, DMB, or DMX, as defined in Table I of the International Standard ISO 8217, as revised in 1996. Fuels meeting the specifications for DMA or DMX are known as marine gas oils, while fuels meeting the specifications for DMB are known as marine diesel oil. For the purposes of our analysis, marine distillate fuel with a sulfur content less than 0.2 % by weight (wt.) is considered a low-sulfur fuel.

Worldwide Availability of Low-Sulfur MGO: As discussed in the Starcrest Report (Starcrest, 2005), France and the Netherlands are the only countries where low-sulfur MGO is readily available. In both countries, low-sulfur marine distillates are supplied in response to the European Commission's regulation of the sulfur content in fuels. Specifically, the European Commission requires the use of marine gas oil at 0.2% sulfur for European Union countries (1999/32/EC). The European Commission will also reduce the sulfur content limit to 0.1% sulfur in 2010 for ships at dockside and in inland waters. However, ports in Europe will continue to provide marine distillate fuels with sulfur contents greater than 0.2%.

In all other parts of the world, low-sulfur marine distillates are not readily available. While low-sulfur marine distillates are available at ports in the United States, Europe, and Far East; in general, bunkering services cannot reliably provide this grade of fuel upon request. (Starcrest, 2005) A summary of these findings is presented in Table I-1 below.

Table I-1: Status of Low-Sulfur MGO Availability at Ports throughout the World

Ports with low-sulfur MGO readily available	Ports with low-sulfur MGO somewhat available*-	Ports with low-sulfur MGO rarely available**	Ports with low-sulfur MGO not available
Netherlands (Rotterdam) France	Canada (Vancouver, B.C.) Los Angeles New York/New Jersey San Francisco Puget Sound Singapore San Diego Oakland Santa Barbara(Hueneme)	Mexico (Lazaro Cardenas) Panama (Balboa, Manzanillo) Charlston Honolulu Norfolk Savannah Japan (Shimzu, Tokyo, Osaka, Nagoya, Moji, Hakata, Yokohama, and Kobe)	China (Hong Kong, Ningbo, Chiwan, Qingdao, Xiamen) South Korea (Busan, Kwangyang) Malaysis (Tanjung Pelepas)

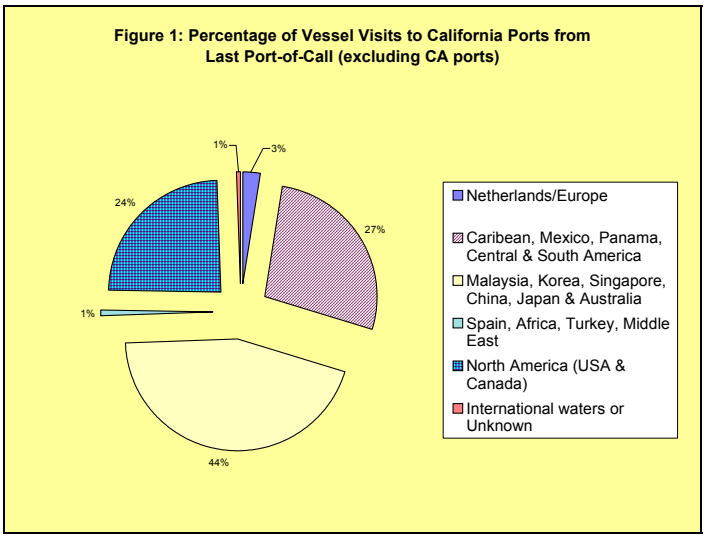
(Starcrest, 2005)
*Low-sulfur fuel can be supplied on a case-by-case basis.
**Low-sulfur fuel cannot be reliably supplied.

Potential Fueling Ports for Vessels that Visit California:

Based on staff contacts with shippers, fuel suppliers, and review of the literature, we found that low-sulfur MGO is not reliably available at California ports or the vast majority of the last port-of-call for vessels bound for California.

Based on our discussions with refiners and suppliers, we concluded that low-sulfur MGO is not readily available at California ports. Refiners and suppliers did indicate that they can supply limited quantities of low-sulfur MGO on a case-by-case basis, but at this time could not guarantee that sufficient fuel would be available at all times. Some of the key reasons for the uncertainty in supply were limited storage capacities for low-sulfur diesel, concerns about fuel barge capacity and availability, and uncertainty in market demand for distillate in other transportation sectors. (Correspondence, 2005)

Staff also investigated the availability of low-sulfur MGO at the port-of-call preceding vessels arriving at a California port. Figure 1 provides data on the region of the last port-of-call for vessels prior to visiting California. As shown in the figures, 44% of the vessels bound for California came from the Pacific Rim (Malaysia, Korea, Singapore, China, and Japan) or Australia. As shown in Table I-1, low-sulfur MGO is rarely available or not available at ports in these regions. Only 3% of the vessels visiting California came directly from regions where low-sulfur MGO is readily available (Netherlands and France).



(California State Lands Commission, 2004)

Refinery Capacity: ARB staff was not able to adequately assess the world-wide refinery capacity for the production of low-sulfur MGO. However, we believe that based on the information available, to create a reliable worldwide supply of low-sulfur marine distillate fuels, fuel producers will need to overcome various global and regional constraints. These constraints include refinery modifications,

feedstock switching, infrastructure improvements, operational changes, changes in bunkering practices. Further, fuel price increases will be needed to offset the costs of creating a sustainable and reliable fuel supply. The cost to refiners could vary greatly based on the grade of crude used, whether the refinery is designed to treat only one type of crude oil, or if the refinery is has logistical or operational constraints. In some countries, the nature of the supply system and infrastructure makes the refiners dependent on one specific type or grade of crude oil. This will limit their ability to quickly adapt to changing product demand and will require significant capital investments. Refineries that use high-sulfur (sour) crude feed stocks will have higher costs to produce low-sulfur marine distillates than refineries that process low-sulfur crude oils. (Starcrest, 2005; Beicip Franlab, 2003) Japan, South Korea, Maya (Mexico), and South America typically process high-sulfur (sour) crude oils.

Conclusion: Based on the data available, staff believes that, in the near-term, low-sulfur MGO is not reliably available at most bunkering ports used by ocean-gong vessels that visit California ports. Staff believes the key to making low-sulfur marine fuel readily available at all ports is the market demand. If there is a long-term market demand for low-sulfur marine distillates at ports, it will become more economically feasible for many refiners and suppliers to make the necessary capital investments and operational modifications to make low sulfur fuel readily available. Because the worldwide trend is toward produce greater quantities of low-sulfur fuels, we believe that the availability of low-sulfur MGO will be more widespread in future years. Staff will investigate the validity of this assumption in a feasibility evaluation that will be conducted relative to the proposed January 1, 2010, fuel requirement to use 0.1 percent sulfur marine gas oil. This evaluation of the feasibility of this fuel requirement will be conducted by ARB staff no later than July 1, 2008. The evaluation will consider, at a minimum, the following:

- the current availability of 0.1 percent sulfur MGO at bunkering ports worldwide;
- the ability of petroleum refiners and marine fuel marketers to supply this fuel by 2010;
- technical considerations such as whether fuel at this lower sulfur level will be compatible with all marine engines; and
- the cost of this fuel.

REFERENCES

(BeicipFranlab, 2003) BeicipFranlab, “Framework Contract for Technical Support in Relation to the Quality of Fuels, Advice on Marine Fuel,” Draft Final Report, October 2003.

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(Correspondence, 2005) BP, P and O Nedloyd, K-Line, Exxon Mobil, American President Lines; E-mail and Telephone conversations with ARB Staff, 2005

(Starcrest Report, 2005) Starcrest Consulting Group, Evaluation of Low-sulfur Marine Fuel Availability – Pacific Rim, July 2005.