6.3 Fuel Facility Alternatives Kahului Harbor

Kahului Harbor serves a critical role for Maui because it is the only harbor on the island that provides fuel transfer facilities. Maui is unlike the other major islands, which all have two harbors with fuel transfer capabilities and therefore some form of redundancy. Efficient and safe operations of the fuel facilities in Kahului Harbor are therefore of utmost importance, not only for continuing the current level of fuel operations but also to accommodate future growth in fuel quantities and the growing market of alternative fuels.

During the course of completing the Fuel Development Plan, numerous design alternatives for improving fuel facilities in the harbor have been identified and developed. Possible alternatives were introduced during the course of the *Kahului Commercial Harbor 2030 Master Plan* efforts. As a result of the initial elaboration, several alternatives were recommended for more detailed analysis while other alternatives were ruled out.

Section 6.3.1 introduces and briefly discusses seven alternatives that were prepared for the Kahului Master Plan efforts. The subsequent sections further elaborate on each of the alternatives that were selected after initial consultations with stakeholders during the master planning process.

6.3.1 Alternatives Presented in the Kahului Master Plan Efforts

Design Alternative A is presented in Figure 6-10. Alternative A, and all other alternatives introduced during the Kahului Master Plan efforts, would provide berthing for two fuel vessels. There would be a newly constructed and dedicated fuel pier beyond the far end of existing Pier 1C near the channel entrance. The new pier would replace the existing piled mooring dolphin that is currently there. The second berth would use the existing Pier 1C. Pier 1C would remain as a multi-use facility and could accommodate a Handysize tanker. New interconnecting pipelines would have to be installed along the perimeter of the harbor along the breakwater to connect the new fuel berths with existing fuel storage tanks.

The advantage of Design Alternative A is that it would separate the fuel facilities away from cargo and passenger operations and move it toward the outer areas of the harbor. This would create valuable pier space in the inner harbor. The disadvantage of this alternative is the need to install one or several 2,400-foot long transfer pipelines that connect the new fuel pier to the existing storage facilities located outside the harbor.

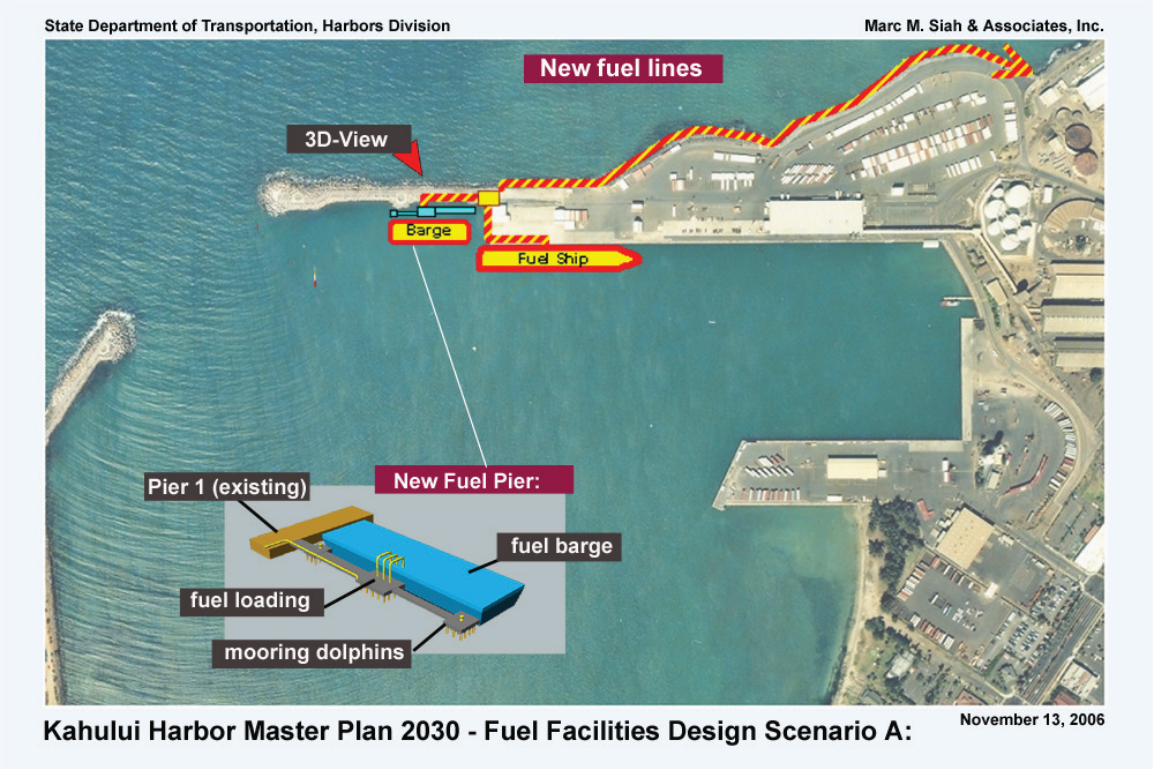

Figure 6-10: Design Alternative A

Design Alternative B is presented in Figure 6-11. It would create a piled fuel pier perpendicular to Pier 3. The fuel barge would then be moored at one side of the new fuel pier. On the other side, a roll on and roll off (RO/RO) cargo barge could be accommodated. The Handysize Tanker would use Pier 1A. The advantage of this scenario is that the perpendicular pier provides one additional berthing space to the harbor. The existing Pier 3 accommodates only one barge.

The advantage of this alternative is that the new fuel berth would be close to the existing fuel pipeline system. Therefore, the cost to connect to existing pipelines would be minimal. The main disadvantage is that the perpendicular pier would protrude into the harbor basin and could negatively affect navigation in the inner harbor basin.

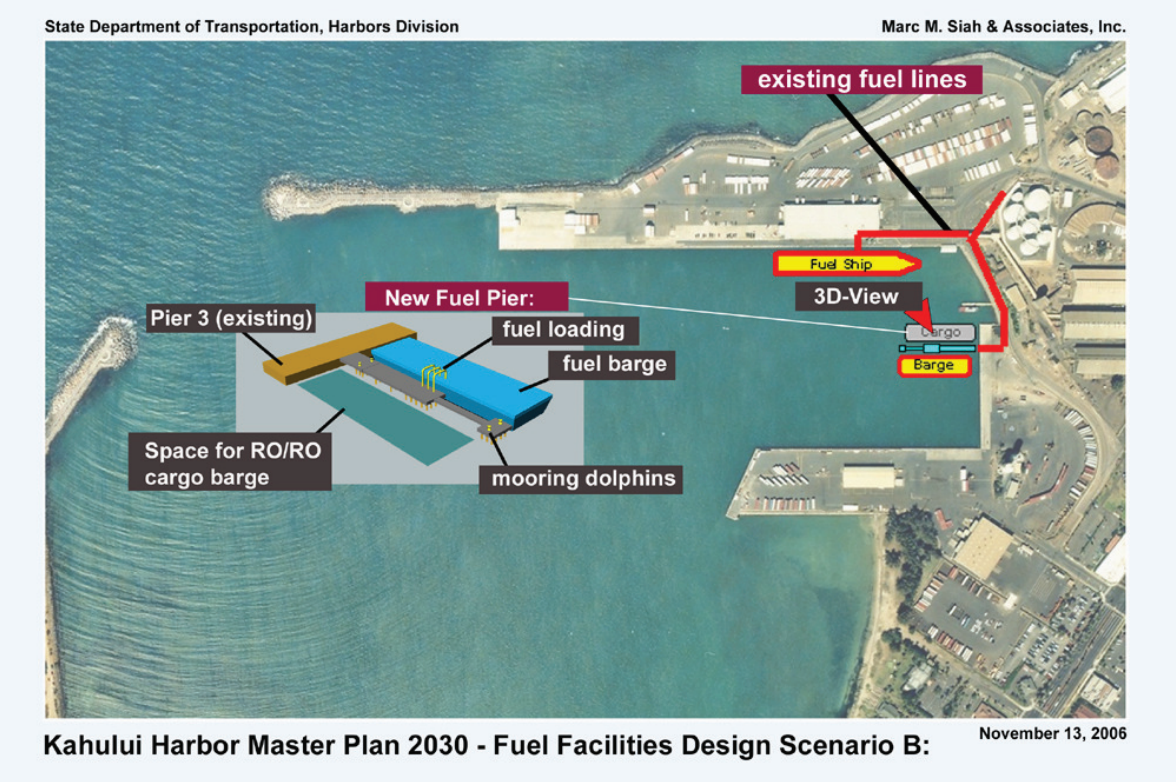

Figure 6-11: Design Alternative B

Design Alternative C is presented in Figure 6-12. It would provide berthing space for a fuel barge at a modified existing Pier 3. The structure would extend the face of Pier 3 outward away from shore-side by using a floating or fixed pier extension to add to existing Pier 3. This alternative would to mitigate the limited water depth in the immediate vicinity of Pier 3. A Handysize Tanker could use existing Pier 1A.

The advantage of this alternative is the limited scope of the pier modification and keeping the installation of new fuel transfer equipment to a minimum.

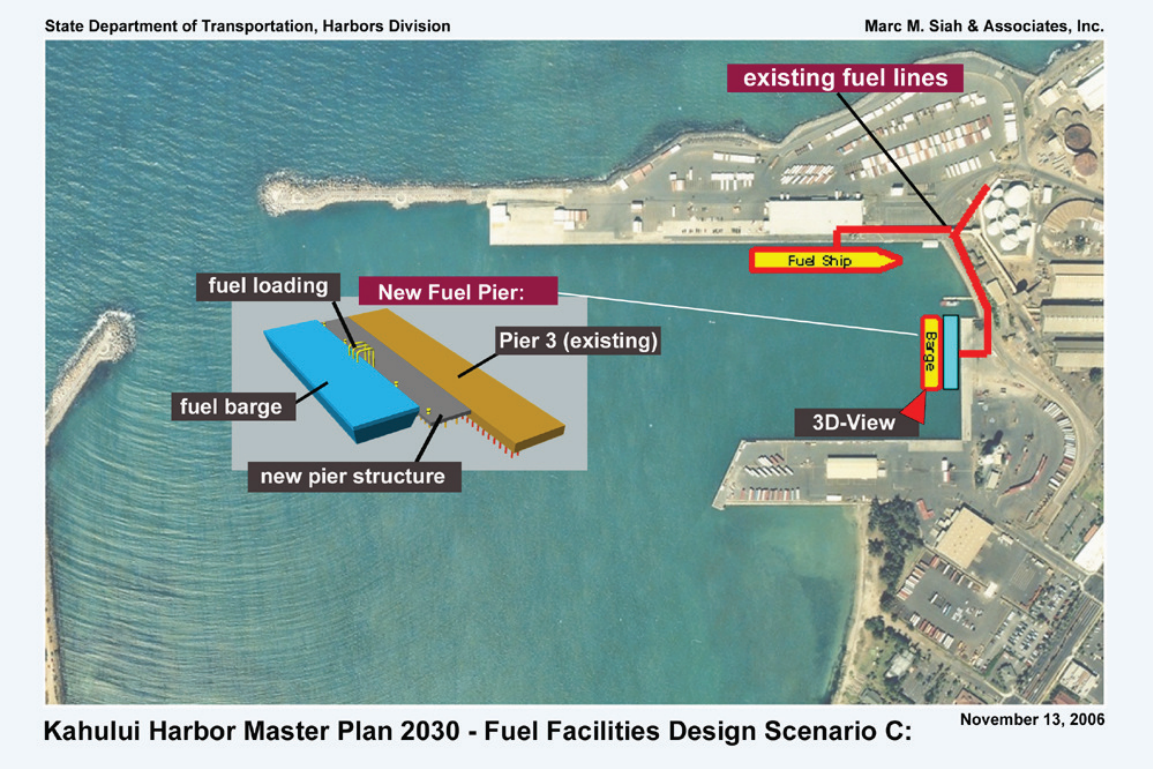

Figure 6-12: Design Alternative C

Design Alternative D is presented in Figure 6-13. It would feature a new protruding fuel pier structure for a dedicated fuel pier south of existing Pier 2 in a previously undeveloped part of Kahului Harbor. This dedicated fuel pier could accommodate fuel barges. A Handysize Tanker could berth at the existing Pier 1.

The advantage of this scenario is that most of the fuel transfer operations would be transferred to a part of the harbor that is undeveloped. Since the pier structure would be a protruding pier, there would be minimal construction costs. The disadvantage would be the proximity to existing recreational uses of the harbor (e.g., canoe clubs). New transfer pipelines would cross a part of the harbor in order to connect to the existing fuel pipeline system at Pier 3.

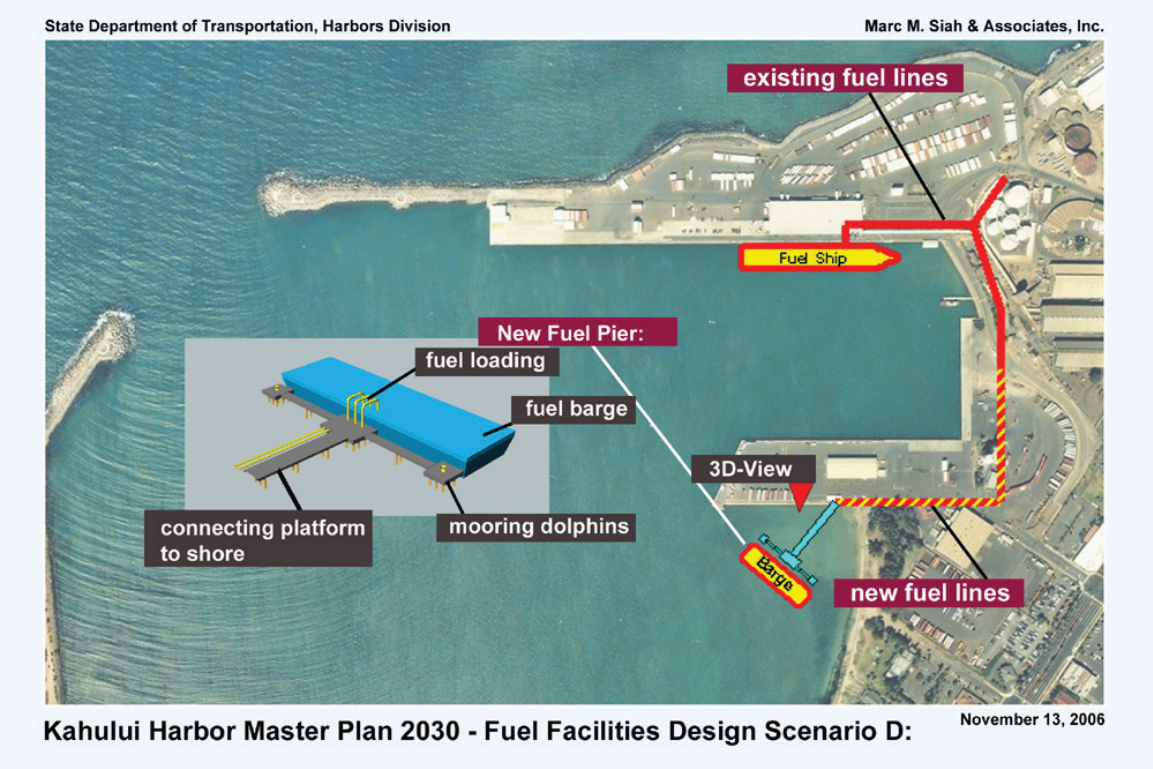

Figure 6-13: Design Alternative D

Design Scenario E is presented in Figure 6-14. Two new protruding fuel piers would be constructed to accommodate tankers and fuel barges at a new Pier 1D and at the shoreward side of a newly constructed breakwater in the western part of the harbor.

The advantage of this scenario is that fuel operation would use a part of the harbor, which is not developed at the present time. The disadvantage is one or more long fuel interconnecting pipelines, which would have to be installed to connect the new fuel piers to the existing fuel transmission pipeline system. The transfer pipelines would connect the new protruding fuel pier in the western part of the harbor. It would require that the pipeline cross the harbor entrance, which could result in costly and elaborate piping construction, with the prospect of significantly affecting ship movement during construction. In addition, the transfer pipelines that would cross the harbor entrance need to be buried deep enough to be sufficiently protected.

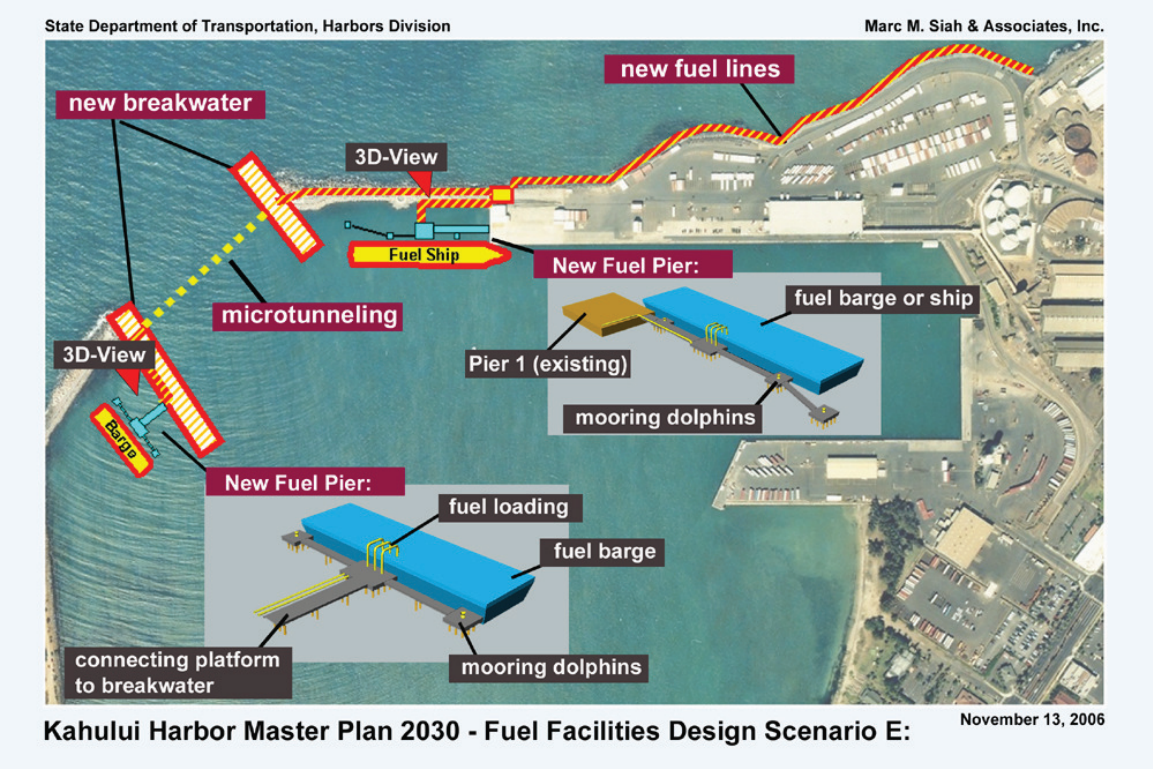

Figure 6-14: Design Scenario E

Design Scenario F would use offshore fuel transfer systems. Offshore fuel transfer systems would have the advantage of freeing Kahului Harbor of fuel transfer operations and of requiring berthing space. Offshore terminals could be located at suitable offshore locations that feature protected waters and suitable shore access for the transfer pipeslines. In the case of Maui, offshore fuel terminals could also be located at a location away from Kahului Harbor, for example, in the southern area of the island. Figure 6-15 shows three variances of offshore fuel loading terminals.

1. A fuel barge is shown moored at a CALM (catenary anchor leg mooring) buoy. CALM fuel buoys are used at many fuel terminals arounf the world and these type of fuel terminals have a good track record. Figure 6-16 shows an example of a CALM buoy. The mooring bridle would hold the fuel barge in position at the single-point mooring system, while the barge could sway according to wind and currents. Fuel would be pumped through flexible and buoyant fuel hoses from the fuel barge to the CALM buoy and from there through a fuel transfer pipeline to the shore side storage facilities.

2. A fuel vessel is shown berthed at a floating fuel terminal to a eight-point mooring system. Fuel barges and even tankers would dock at the fuel terminal and discharge into the terminal pipeline system, thus avoiding floating hoses, as in the case of the CALM buoy. Since the eight-point mooring system does remain in a fixed orientation, this configuration might be affected by rough sea conditions during fueling operation.

3. A floating fuel terminal could also be configured as a single-point mooring system. This configuration has the advantage that the floating fuel terminal orients itself to a downwind or down current direction, thereby avoiding adverse sea conditions during loading.

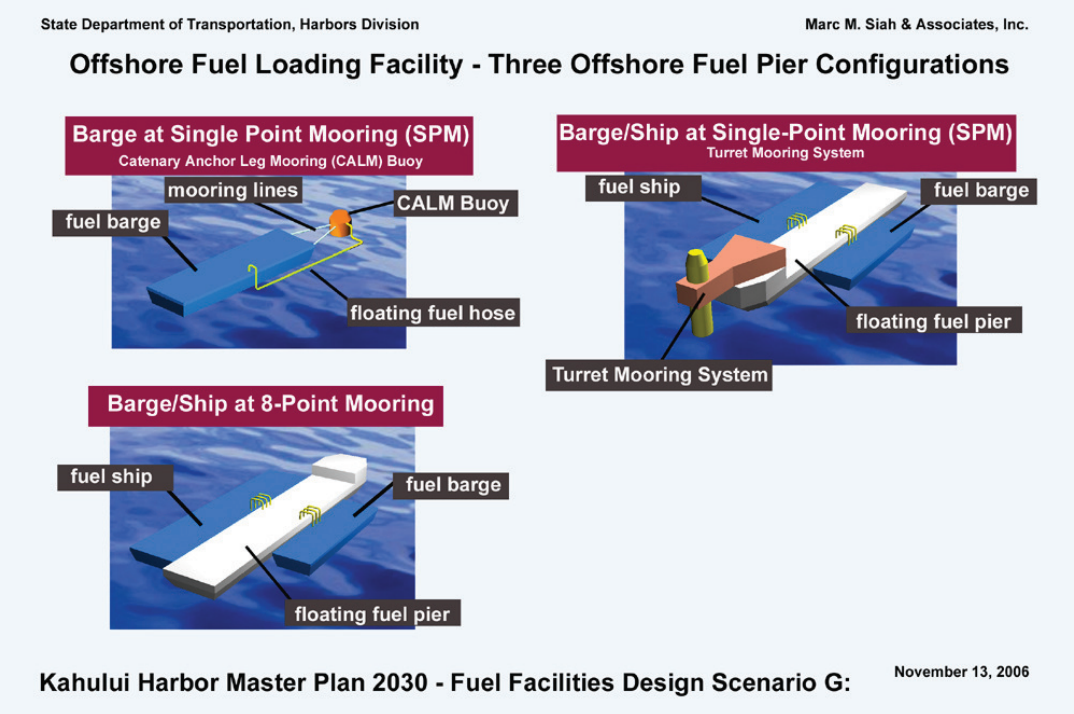

Figure 6-15: Design Alternative F

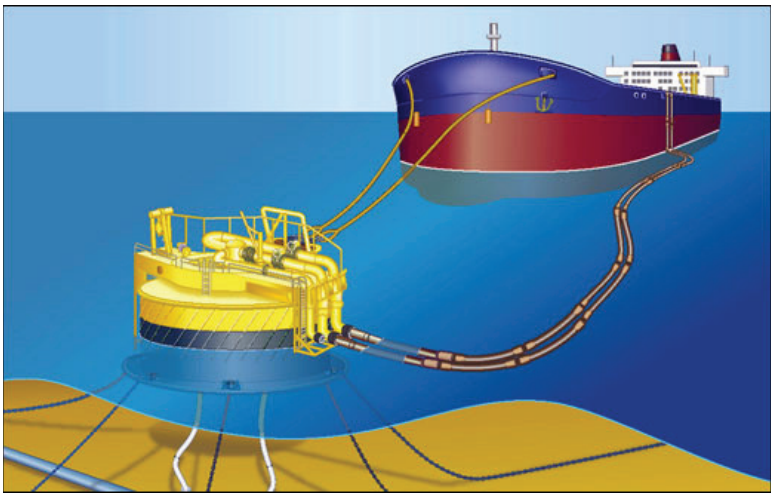

Figure 6-16: Fuel Tanker moored at CALM Buoy During Offshore Fuel Transfer
(Photo Credit IPS Innovative Pipeline Services)

6.3.2 Preferred Master Plan Design Scenarios

Initial deliberations of stakeholders during the *Kahului Commercial Harbor 2030 Master Plan* recommended the following selections from the Kahului Master Plan fuel facilities alternatives

1. Fuel facilities following Design Scenarios A, B and C are favored over other scenarios. It is preferred that the fuel facilities remain in the eastern part and established areas of Kahului Harbor, namely in the area of Piers 1 and 3.

2. Fuel facilities represented by Design Scenarios D and E were not favored and will no longer be considered. These facilities are using preferably undeveloped areas of Kahului Harbor, which might be used for future development of cargo facilities or passenger terminal or which are close to recreational areas.

3. Offshore fuel terminals were not found appropriate and will not be considered. It was, however, recognized that offshore terminals might be viable redundant fuel transfer facilities.

6.3.3 Design Alternatives for Kahului Harbor

Based on the above, five alternatives were developed. A brief overview of each alternative is described below:

1. Conceptual Design Alternative A. This incorporates two locations of fuel transfer: (1) the new Pier 4, constructed perpendicular to Pier 3 would be dedicated for fuel barges. and (2) an upgraded fuel berth at the existing Pier 1A, that could accommodate Handysize Tankers.

2. Conceptual Design Alternative B. This incorporates two locations of fuel transfer: (1) the new Pier 1D, constructed as a segmented protruding pier next to existing Pier 1C, would be dedicated for fuel barges and (2) an upgraded fuel berth at the existing Pier 1C, that could accommodate Handysize Tankers.

3. Conceptual Design Alternative C. This incorporates two locations of fuel transfer: (1) the new Pier 1D, constructed as a conventional continuous pier next to existing Pier 1C would be mixed-cargo pier for fuel barges and general cargo and (2) an upgraded fuel berth at the existing Pier 1C that could accommodate Handysize Tankers.

4. Conceptual Design Alternative D. This incorporates two locations of fuel transfer: (1) the expanded Pier 3, constructed as a piled pier structure next to existing Pier 1C would be mixed-cargo pier for fuel barges and general cargo and (2) an upgraded fuel berth at the existing Pier 1A, that could accommodate Handysize Tankers.

5. Conceptual Design Alternative E. This incorporates two locations of fuel transfer: (1) the modified Pier 3, where Pier 3 would be equipped with a sheetpile apron to allow

dredging and would be a mixed-cargo pier for fuel barges and general cargo and (2) an upgraded fuel berth at the existing Pier 1A that could accommodate Handysize Tankers.

Figure 6-17 shows the locations of these five alternatives. The alternatives A, D and E are modifications or expansions of fuel facilities at Pier 3. Alternatives B and C incorporate the construction of new fuel piers as additions to Pier 1.

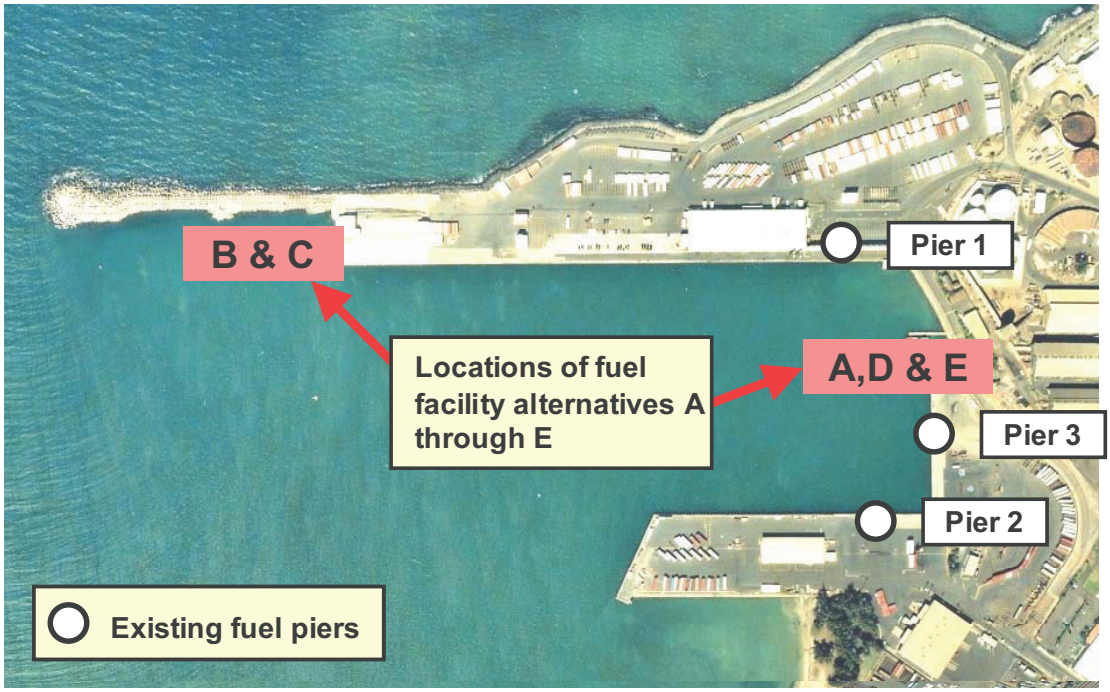

Figure 6-17: Locations of Fuel Facility Alternatives

6.3.4 Design Framework for Future Fuel Facilities

Considering the three energy design schemes as described in Section 4, Kahului Harbor could support the following future fuel related functions:

1. Off-loading fuel barges, which bring petroleum products (including liquid petroleum gas (LPG) to Maui.

2. Off-loading Handysize tankers that would bring LPG to Maui.

3. Off-loading Handysize tankers or barges that transport biofuel feedstock to Maui.

4. Loading barges that transport biofuels or biofuel feedstock between the Hawaiian Islands.

5. Off-loading of compressed natural gas (CNG) barges to supply natural gas (NG) to the island gas utility (emerging technology).

It is anticipated that the range of fuel types to be handles in the future would include the following:

1. Clean petroleum products (conventional and evolving), possibly also some dirty fuels, such as residual fuels for power plants.

2. Non-petroleum products (i.e., ethanol, biodiesel, biofuel feedstock such as vegetable oil, molasses, etc.).

3. LPG (i.e., propane, butane).

4. Possibly CNG in the future.

For the five fuel shipping functions listed above, the following vessel types would have to be accommodated at the future fuel pier (please note that the vessel type 4, below, the CNG barge represents a new fuel technology that would be applicable in Hawaii if liquefied natural gas (LNG) would be introduced as a major energy component):

1. Double-hull fuel barge: 400-foot long by 80-foot wide by 28-foot deep draft, capacity of approximately 80,000 barrels.

2. Gas barge: 246-foot long by 46-foot wide by 12-foot deep draft, capacity of approximately 16,000 barrels.

3. Handysize Tanker: 600-foot long by 95-foot wide by 34-foot deep draft, capacity of approximately 225,000 barrels.

4. CNG barge (evolving shipping technology) with unknown overall dimensions.

6.3.5 Conceptual Design Alternative A

Figure 6-18 (and Figures 6-19 and 6-20 for detailed descriptions) shows the plan view of Design Alternative A. Alternative A incorporates two locations of fuel transfer: (1) the new Pier 4, which would be constructed perpendicular to Pier 3 and designed to accommodate fuel barges and (2) an upgraded fuel berth at the existing Pier 1A that would accommodate Handysize Tankers. Pier 4 would be a dedicated fuel pier, whereas Pier 1A would remain as a multi-use facility. Therefore, Alternative A would provide a fuel transfer infrastructure to unload and load both fuel barges and Handysize Tankers. The new Pier 4 is a piled structure, which would accommodate a fuel barge on one side and a roll-on/roll-off (RO/RO) cargo barge on the other. The most important advantage of Pier 4 would be the short distance to existing fuel pipelines and storage facilities. However, the foremost disadvantage of Pier 4 is that it would protrude far into the existing harbor basin and might affect the navigation of larger ships moored at Piers 1A and 1B.

6.3.5.1 Pier 1A Modifications for Fuel Barges and Tankers

Fuel barges and Handysize Tankers would be moored and unloaded/loaded at upgraded fuel transfer facilities at existing Pier 1A. The types of fuels handled at Pier 1A would include: gasoline, diesel, residual oil, biofuels and biofuel feedstock. There are existing fuel lines in Pier 1A that could be incorporated into the final design.

The new pier would have the following components:

1. The upgraded fuel pier at Pier 1A would be preferably fitted with loading arms. Permanently installed loading arms, however, could impede mixed-cargo operations at Pier 1A. It has to be determined if loading arms at Pier 1A are too obstructive for the mixed cargo use of Pier 1A.

2. In order to improve the fuel transfer operation and to shorten the time for loading/off-loading, installation of new interconnecting pipelines on or below Pier 1A is recommended where existing pipelines are too small to discharge the quantities of fuel anticipated.

3. Fire suppression system. Two fixed foam monitors, using seawater for foam generation, would be installed on Pier 1A. Different types of foam would be required for different fuel that is handled. The fixed foam monitors are installed on shore-side at suitable locations to allow good working coverage of foam spray on the fuel berth.

4. Adequate fixed lighting would be installed to illuminate all parts of the fuel pier that are critical for operating the fuel pier.

6.3.5.2 New Pier 4 for Fuel Barges

The new Pier 4 would only accommodate fuel barges, but no tankers. It would be constructed as a piled pier extending perpendicular from Pier 3 towards Kahului Bay. Though one side of the new pier would be a dedicated fuel pier, the other side would accommodate a roll-on/roll-off (RO/RO cargo) barge. The RO/RO cargo barge would load over the stern from Pier 3. This configuration would accommodate two barges simultaneously, thereby providing one additional berthing space than would otherwise be available at Pier 3.

The existing structure of Pier 3 would be incorporated into the design of the dedicated fuel pier. RO/RO cargo barges would load or unload over a stern ramp. Interconnecting pipelines would extend onto the fuel pier. Additional or new pipelines would have to be installed in order to make the fuel transfer between Pier 4 and the fuel storage tanks more effective and to allow for new types of fuels.

Pier 4 would have the following components:

1. Three breasting dolphins would be installed with mooring bollards and fendering systems. The breasting dolphins would be connected to the roadway of the fuel pier. The roadway would connect the fuel transfer platform with Pier 3.

2. One mooring dolphin would be installed that is not connected to the roadway. This stern mooring dolphin would be accessible by a catwalk via the fuel pier structure.

3. Infrastructure that incorporates land-based loading ramps or supports ship borne loading ramp would be installed on Pier 3. This would allow the RO/RO cargo barge to be loaded/off-loaded over the stern.

4. Four adjacent breasting dolphins would be constructed as piled structures, each with a mooring bollard and fendering systems; two breasting dolphins would each have a disembarkation platform attached to the breasting dolphin platform to allow safe access to the fuel barge.

5. Two mooring dolphins would be constructed as piled structures, each with a mooring bollard.

6. Fuel loading arms (either single-product or dual-product loading arms) would establish safe and efficient shore-to-ship fuel transfer connections. The number of loading arms would be determined by the type of fuel to be loaded and unloaded at the fuel berth.

7. A piled roadway would connect the fuel transfer platform structures with Pier 3. The roadway could accommodate a medium-size service truck to maintain the pier components (e.g., loading arms, fire protection system, fendering system, etc.). The roadway would incorporate precast concrete structural parts in order shorten the construction time of the new pier. The roadway would support cantilevered truss structure, on which the interconnecting pipelines would be installed that convey the fuel from the fuel transfer platform and connect to interconnecting pipelines in Pier 3.

8. Fire suppression system. Two fixed foam monitors using seawater for foam generation would be installed on the pier next to the loading platform. Different types of foam would be required for different fuel that is handled. The fixed foam monitors are installed shore-side at suitable locations to allow a good coverage of foam spray on the fuel berth.

9. Adequate fixed lighting would be installed to illuminate all parts of the fuel pier that are critical for operating the fuel pier.

10. A central fuel monitoring system (fuel flow, pressures, temperatures, etc.) would inform the operator about fuel transfer progress. The fuel monitoring system would be equipped with alarms for certain high or low controls functions.

11. An alarm system would alert the operator to stop pumping when the unloading arms near the limits of their reach.

12. An emergency shutdown system could be activated from a central point or at the pier.

13. Adequate draft at the dedicated fuel pier is established by dredging to a continuous depth of 35 feet.

14. Depending on operational requirements (compatibility of fuel), new fuel pipelines for a range of fuel products (e.g., gasoline, diesel, jet fuel, ethanol, biodiesel, LPG) would be installed on the fuel transfer platform.

15. The interconnecting pipelines would be installed on pipeline supports that would be attached to the roadway that spans between the fuel transfer platform and Pier 3.

16. The new fuel pipelines would connect to existing pipelines that are presently installed in Pier 3.

17. Pipelines for LPG and a fuel transfer hatch are presently installed in Pier 2. Since the normal LPG transfer from the fuel barges would be carried out at the new fuel pier, the new transfer pipelines that serve the new fuel pier would be connected to the existing LPG piping system at Pier 2.

18. As required, new interconnecting pipeline would be installed for future fuel types. The installation of new pipelines on above-ground pipeline racks would offer flexibility of construction and maintenance. New interconnecting pipelines from Pier 3 to the fuel storage tanks outside the harbor would be installed as below-ground pipeline.

All fuel storage tanks are presently located outside of Harbors Division's property and therefore are operated and/or owned by individual fuel companies. The current fuel storage capacity is very limited if the number of days of fuel supply is considered. For example, there is approximately a minimum of 7 days worth of gasoline on Maui at any given time. By law, the number of days of fuel for electrical generation is approximately 30 days. The installation of

additional storage capacity is deemed necessary to expand the storage capacities to meet the needs of current petroleum products, but also for biofuels and its feedstock and other emerging petroleum-based fuels. Because of the finite space in Kahului Harbor, storage facilities within Harbors Division's property will not be considered at this time unless additional lands are acquired.

6.3.6 Conceptual Design Alternative B

Figure 6-21 shows the plan view of the Design Alternative B. Alternative B incorporates two fuel transfer locations: (1) the new Pier 1D would accommodate fuel barges and (2) a new fuel berth at existing Pier 1C would accommodate Handysize tankers. The new Pier 1D would be a piled pier structure. The main advantage of Pier 1D is that it could be cost-effectively constructed at a location in the harbor that is not in use at the present time. However, the main disadvantage is one or multiple long fuel pipelines that would be required to connect the fuel transfer facilities at Piers 1D and 1C with existing fuel storage facilities in the eastern part of Kahului Harbor.

Alternative B (refer to Figures 6-22 and 6-23 for detailed descriptions) includes two improvements: (1) new Pier 1D and (2) Pier 1C modifications.

6.3.6.1 New Pier 1 D for Fuel Barges

Fuel barges would off-load at a new dedicated fuel pier, designated as Pier 1D. The fuel pier structure would be recessed from the pier face of Pier 1. This could have the advantage that the wave climate at the proposed location of the new pier would be less than if the pier was aligned with the face of Pier 1. A roadway, which would provide access to the pier, would be constructed and would connect the fuel transfer platform with the existing Pier 1C. A new fuel transfer pumping station would be installed on Pier 1C. The existing piled mooring dolphin with a concrete catwalk that connects it to Pier 1C would be demolished.

Pier 1D would have the following components:

1. A dedicated fuel pier would be constructed at the northern end of existing Pier 1C. The fuel pier would be constructed as a piled pier structure.

2. Four adjacent breasting dolphins would be constructed as piled structure, each with mooring bollard and fendering systems; two breasting dolphins would each have a disembarkation platform attached to the breasting dolphin platform in order to allow safe access to the fuel barge.

3. Two mooring dolphins would be constructed as piled structures.

4. Catwalks would connect the breasting and mooring dolphins among each other and to the roadway.

5. Fuel loading arms (either single-product or dual-product loading arms) would establish safe and efficient shore-to-ship fuel transfer connections. The number of loading arms would be determined by the type of fuel to be loaded and unloaded at the fuel berth.

6. A piled roadway would connect the fuel transfer platform with Pier 1C. The roadway could accommodate a medium service truck to maintain the pier components (loading arms, fire protection system, fendering system, etc.). The roadway would use precast concrete structural parts in order to shorten the construction time. The roadway would support a pipe way for the interconnecting pipelines that would connect the fuel transfer platform with pipelines on Pier 1C.

7. Fire suppression system. Two fixed foam monitors using seawater for foam generation would be installed on the pier next to the loading platform. Different types of foam would be required for different fuel that is handled. The fixed foam monitors would be installed shore-side at suitable locations to allow good coverage of foam spray on the fuel berth.

8. Adequate fixed lighting would be installed to illuminate all parts of the fuel pier that are critical for operating the fuel pier.

9. A central fuel monitoring system (fuel flow, pressures, temperatures, etc.) would inform the operator about fuel transfer progress.

10. An alarm system would alert the operator to stop pumping when the unloading arms near the limits of their reach.

11. An emergency shutdown system that could be activated from a central point or at the pier.

12. Adequate draft at the dedicated fuel pier would be established by dredging to a continuous depth of 35 feet.

13. Interconnecting pipelines would be installed in Pier 1D to connect the fuel transfer station with the fuel transfer pumping station. The pipelines would be installed in a below-ground pipeline gallery. The pipeline gallery would have removable cover to allow for cost-effective installation and efficient maintenance.

14. A fuel transfer pumping station would be constructed at Pier 1C. The fuel pumping station would be equipped with a number of fuel pumps that act as booster pumps for the long transfer pipelines that connect the new fuel facilities with the existing fuel tank farms. Booster pumps would increase the liquid fuel pressure in the pipelines, since the capacities of the pumps on the barges might not be adequate to transfer the fuel over the significant distance to the existing fuel storage tanks. Since the shore-side fuel pumps operate with electric power, emissions by tankers and barges during unloading could be significantly diminished.

15. Interconnecting pipelines would be installed above-ground from the fuel transfer pumping station on Pier 1C to the existing storage facilities, which are located in the

eastern part of Kahului Harbor, outside the harbor boundary. The total length of each interconnecting pipeline would be approximately 2,400 feet. The pipelines would be installed above-ground on pipeline racks. The pipeline racks would be located inside the harbor peripheral fence. The pipeline and pipeline racks would be protected by bollards against accidental impact from trucks.

16. The number of required interconnecting pipelines would be determined by the type of fuel to be conveyed. Installation of pipelines on pipeline racks would offer a cost-effective and flexible installation and efficient maintenance of the pipelines. As an alternative to transferring the fuel through multiple product pipelines over the long distance between the new fuel pier and the existing tank farms, piggable pipelines could be used in order to pump batch trains of different products through one or two pipelines. This would reduce the number and therefore the costs of the interconnecting pipelines.

6.3.6.2 Pier 1C Modifications for Fuel Tankers

A Handysize tanker would moor and off-load/load at the existing Pier 1C. New fuel transfer components would be installed at Pier 1C in order to allow a safe and efficient unloading/loading of fuel and fuel feedstock.

Pier 1C would have the following components:

1. Fuel loading arms (either single-product or dual-product loading arms) would establish safe and efficient shore-to-ship fuel transfer connections. The number of loading arms would be determined by the type of fuel to be loaded and unloaded at the fuel berth.

2. Bollards would be installed around the fuel transfer station in order to secure the loading arms and above ground transfer pipelines from accidental impact by trucks, which operate on the multi-use pier.

3. Fire suppression system. Two fixed foam monitors, using seawater for foam generation would be installed on the pier next to the loading platform. Different types of foam would be required for different fuel that is handled. The fixed foam monitors are installed at suitable locations to allow good working coverage of foam spray on the fuel berth.

4. Adequate fixed lighting would be installed to illuminate all parts of the fuel pier that are critical for operating the fuel pier.

5. Transfer pipelines would be installed to connect the fuel transfer station at Pier 1C with the fuel transfer pumping station. Transmission pipelines would be installed underground in a concrete pipe gallery with a removable cover for easy installation and maintenance.

All fuel storage tanks are presently located outside of Harbors Division's property and therefore are operated and/or owned by individual fuel companies. The current fuel storage capacity is

limited if the number of days of fuel supply is considered. For example, there is approximately 7 days worth of gasoline on Maui at any given time. By law, the number of days of fuel for electrical generation is approximately 30 days. The installation of additional storage capacity is deemed necessary to expand the storage capacities to meet the needs of current petroleum products, but also for biofuels and its feedstock and other emerging petroleum-based fuels. Because of the finite space in Kahului Harbor, storage facilities within Harbors Division's property will not be considered at this time unless additional lands are acquired.

6.3.7 Conceptual Design Alternative C

Figure 6-24 shows the plan view of Design Alternative C. Alternative C incorporates two fuel transfer locations: (1) the new Pier 1D that could accommodate fuel barges and (2) a new fuel facility on the existing Pier 1C, which could accommodate Handysize tankers. The new Pier 1D would be a multi-use pier using a combination of pilings and bulkhead designs. The main advantage of Pier 1D would be the multi-use mode of cargo operations. Pier 1D would not be dedicated to fuel transfer and therefore increases the cargo handling capacity of Kahului Harbor. The main disadvantages of Alternative C would be the high cost of constructing a conventional bulkhead pier and the fact that the new fuel transfer pier would not be a dedicated fuel pier. In addition, a major drawback of Alternative C would be the required long fuel pipelines to connect the new fuel transfer facilities with the existing fuel storage facilities in the eastern part of Kahului Harbor.

Alternative C (refer to Figures 6-25 and 6-26) includes two improvements: (1) new multi-use Pier 1D and (2) Pier 1C modifications.

6.3.7.1 New Pier 1D

Fuel barges would unload at a new fuel pier, designated as Pier 1 D. Pier 1D would be located north of the existing Pier 1C. Pier 1D would be a multi-use pier using a combination of pilings and bulkhead designs. The pier face of Pier 1D would be in line with the face of existing Piers 1A through 1C. It is anticipated that the wave action at Pier 1D would be more severe than at the recessed fuel pier proposed in Alternative B described above. The fuel transfer pumping station and the above ground long interconnecting pipelines would be identical with Alternative B.

Pier 1D would have the following components:

1. A fuel transfer station would be installed on the new, multi-use Pier 1D. The new pier would be a conventional bulkhead pier with an outward piled section.

2. Fuel loading arms (either single-product or dual-product loading arms) would establish safe and efficient shore-to-ship fuel transfer connections. The number of loading arms would be determined by the type of fuel to be loaded and unloaded at the fuel berth.