

**The Landed Cost of Crude Oil:  
A Comparison of Selected Gulf Coast Ports Under  
Varying Oil Market Conditions**

**For**

**Port of Corpus Christi Authority**

**By**

Milton L. Holloway, Ph.D.  
Resource Economics, Inc.  
700 Lavaca Street  
Suite 1400  
Austin, Texas 78701  
(512) 794-8511

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## **Executive Summary**

The purpose of this report is to make a comparison of the costs of delivering foreign crude oil to refineries on the Gulf Coast at ports in Corpus Christi (PCCA), Houston (PHA), Beaumont (PB) and Texas City (TC). Two previous studies for PCCA have made such comparisons and have concluded that PCCA held a favorable competitive position among the competing ports on the Texas Gulf. The current report provides an update to such analyses and evaluates whether the prior evaluation results were anomalous or peculiar to the oil and shipping market conditions at the time. The basis for the comparison is landed costs, or the total cost of oil delivered to the private oil docks in the four ports under conditions of varying oil and shipping market conditions.

The central question the study addresses is whether the competitive position of the port at Corpus Christi relative to PHA, BP and TC are affected by the changing conditions of the U.S. and world oil and shipment markets. The study examines the oil market movements since 2004 as the price of imported oil has varied from an annual average \$36 per barrel in 2004 to \$93 per barrel in 2008 and back to \$69 during the first one-half of 2009. The peak spot market oil price reached a high of \$134 per barrel on July 18, 2008. By September 5, 2008 the price had fallen to \$106 per barrel and to \$32 on January 2, 2009. The tanker and lightering market prices are affected by the oil market dynamics but have their own supply and demand factors that result in market price changes for shipments both at sea and in lightering zone-to-port shipments that are related, but not in lock-step with oil market price movements. The relationship of the landed cost of oil to these several economic conditions that surround such movements in the price of crude oil are examined and evaluated as to whether they impact one port more than the others.

The landed costs of foreign crude oil on the Texas coast includes the F.O.B. price of the oil at the port of origin, the transportation (tanker) cost of movement at sea from the port of origin to the lightering zone in the Gulf, the lightering costs to shuttle the oil to docks in the Gulf ports and port charges. The market for lightering services typically includes the loading and unloading, shipment to the docks, and piloting and tug services. Minor port charges such as wharfage are excluded from lightering costs and are passed through to the shipper. Finally, local taxing authorities may impose property taxes that are a factor in the landed cost of crude oil. Therefore the landed cost can be summarized as the sum of the price of the oil, the tanker cost at sea, lightering cost, wharfage fees and property taxes.

Lightering service prices among the various ports are the result of competitive market conditions of suppliers in the market and several factors peculiar to the port such as the sea travel distance to port from the lightering zone, limitations on night-time tanker movements in the ship channel, crowding and turning ease in the port area and, importantly, draft limits due to channel depth. As a general matter PCCA enjoys a net efficiency advantage over Houston and Beaumont in that while it is a further sea distance from the lightering zone it has no night-time tanker limitation and has an equal or deeper channel with less crowding and more efficient port time delays.

The competitive advantage of Corpus Christi relative to Houston, Beaumont and Texas City are indicated by way of comparison of crude oil delivery costs for two particular tanker sizes that deliver a major portion of imported crude oil. The two dominant tanker sizes for foreign shipments include the VLCC, approximately 2.0 million-barrel capacity, and the Suezmax, approximately 1.0 million-barrel capacity. Table ES 1 compares the four ports and two tanker sizes for three cases of port depths and related dock expansions under current (year 2009) market conditions. The two previous studies made the same comparisons under the then current market conditions and these study summary tables are reproduced in Appendix B to this report.

**Table ES 1. Summary of Landed Cost Differences Between Corpus Christi, Houston, Beaumont and Texas City:  
Private Oil Docks: Two Tanker Classe With Year 2009 Prices**

	Corpus Christi & Houston		Corpus Christi & Beaumont		Corpus Christi & Texas City	
	VLCC	Suezmax	VLCC	Suezmax	VLCC	Suezmax
Case I. Houston Deepened Channel Depths to Beltway 8: Current Average Lightering Costs (Corpus 45', Houston 45' Beaumont 40' & Tx City 40')	-\$0.072	-\$0.023	-\$0.143	-\$0.072	-\$0.034	-\$0.074
Case II. Houston Deepened Channel Depths to Beltway 8: Weighted Average Where Shell, ITC & VOPAK do not Upgrade Docks & Including Pipeline Deleveries from Texas City (Corpus 45', Houston 40' - 45' & Beaumont 40' & Tx City 40')	-\$0.159	-\$0.085	-\$0.143	-\$0.072	-\$0.034	-\$0.074
Case III. Planned Corpus Christi and Texas City Channel Depths (Corpus 52', Houston 45' & Beaumont 40' & Tx City 45')	-\$0.239	-\$0.176	-\$0.306	-\$0.224	-\$0.067	-\$0.150

The first comparison in Table ES 1 (Case I) contrasts Corpus Christi with Houston, Beaumont and Texas City with port depths as the ports currently exist except it understates the average situation for Houston because it ignores the fact that all refineries on the Houston ship channel do not have access to the deeper water of the recent deepening project. Case II is a separate version of Case I that recognizes that the entire length of the Houston Ship Channel has not been expanded to 45 feet and that not all importers of crude oil have expanded their docks to take advantage of the deeper channel. Case III compares estimated costs at Corpus Christi with the other ports where the Corpus Christi and Texas City ship channels have been deepened to 52 and 45 feet, respectively per the plans currently in play.

Corpus Christi has a competitive advantage of \$0.072 per barrel with Houston in Case I for VLCC and \$0.023 per barrel for Suezmax tanker sizes. The comparison of Corpus Christi with Houston is based on the current distribution of all Suezmax and VLCC crude oil imports among the major importers as though all the barrels imported take advantage of the expanded port depths based on current average lightering rates. So this comparison applies to some refineries on the Houston ship channel but not to the average. The Corpus Christi advantage for Corpus Christi relative to Beaumont is \$0.143 for VLCC and \$0.072 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.034 for VLCC and \$0.074 for Suezmax.

Case II contrasts Corpus Christi with Houston but recognizes that the Houston Ship Channel has been expanded only up to the Beltway 8 bridge and that not all private docks have been upgraded to take advantage of the PHA widening and deepening project, namely Shell, ITC and VOPAK docks do not appear to have been upgraded and thus continue to experience shipment costs based on a 40 foot channel. In addition, Case II recognizes that about 18% of Houston refinery input from foreign sources is delivered by way of pipeline from Texas City at lower costs than direct shipments via the Houston Ship Channel. The Case II comparison between Corpus Christi and Houston uses a weighted average landed cost estimate for Houston based on lightering cost for volumes through the 40 foot deep channel, lightering cost for volumes through the 45 foot channel and volumes delivered via pipelines from Texas City.

In Case II Corpus Christi has a competitive advantage with Houston amounting to \$0.159 per barrel for the VLCC class ship and \$0.085 for the Suezmax. The comparisons of Corpus Christi with Beaumont and Texas City are the same as in Case I.

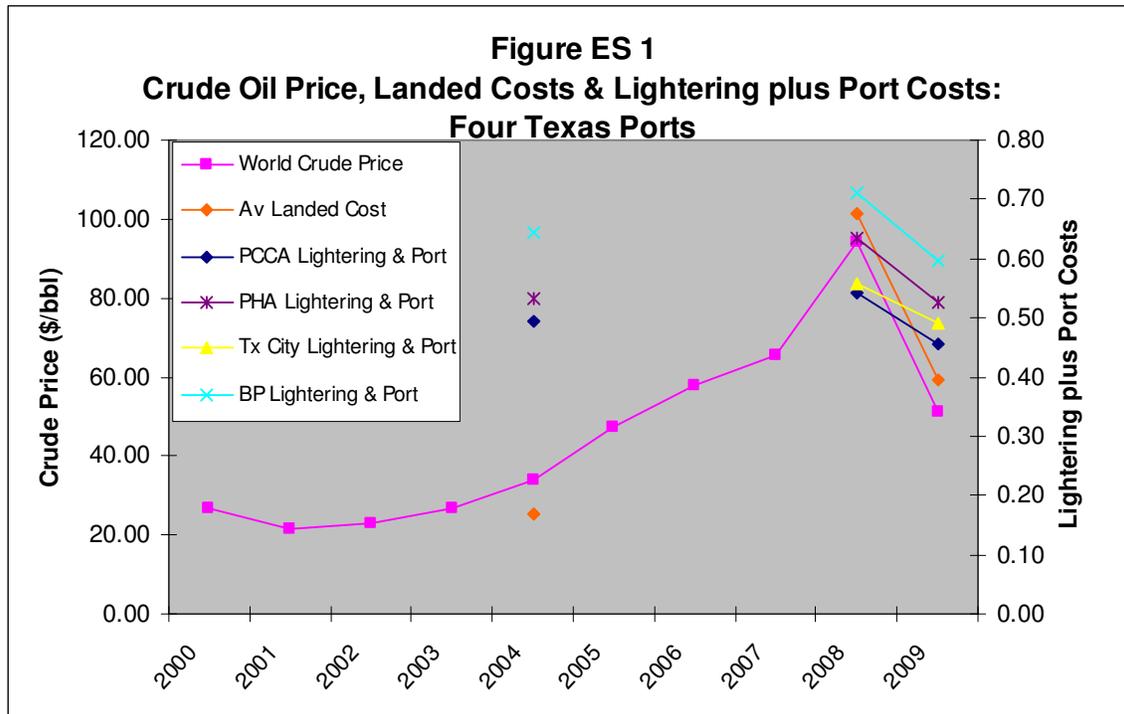
Case III assumes a pending decision takes place by PCCA to expand the channel from 45 feet to 52 feet and that Texas City completes their expansion as scheduled for 2014. If the Corpus Christi planned expansion proceeds Corpus Christi will expand its competitive advantage with Houston to a \$0.239 per barrel advantage for VLCC and \$0.176 for Suezmax. The advantage for Corpus Christi relative to Beaumont is \$0.306 for VLCC and \$0.224 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.067 for VLCC and \$0.150 for Suezmax.

Market and port conditions have changed since the 2004 and 2008 studies were completed including the crude oil price, tanker charter rates, lightering market prices, property tax rates and wharfage rates. In the aggregate, however, for all lightering plus port costs and prices, the order of costs among the ports has not changed (Figure ES1).

The total landed cost at Texas Gulf ports tracks the world spot market price for crude oil over time although the spot crude price is a “leading” value that tends to be above average landed costs when the market is rising, and below when the market starts to fall. Lightering prices have risen and fallen with demand over the period since 2004. The estimated lightering plus port charges for 2004, 2008 and 2009 in relation to the annual average crude oil price (average spot market) is displayed in Figure ES1 where crude prices are measured on the left vertical axis and lightering prices on the right.

Since the 2004 study was completed PCCA raised the wharfage fee on private docks from \$0.02 per barrel in 2004 to \$0.0415 in 2008, including a 12% security surcharge. The surcharge has since been lowered to 10% for 2009. Texas City added a \$0.03 per barrel surcharge to finance their port expansion to a 45 foot depth and Beaumont added a \$0.00375 security charge. The Houston ship channel has been deepened to 45 feet for much of the channel, however, not all refiners have deepened their docks to take advantage of the deeper channel and that condition remains unchanged since the 2008 study. The combined set of changes under current port depths and market prices,

however, leave PCCA at a competitive advantage relative to Houston and Beaumont, and Texas City.



While the market for shipping, including lightering, is currently undergoing a major adjustment it is not expected that declining or rising prices will significantly affect the PCCA competitive advantage estimated in this and previous studies.

In summary, Corpus Christi has a remaining competitive advantage in the delivery cost per barrel for foreign crude oil shipments via large tankers when compared to Houston, Beaumont, and Texas City. The movements from low to high oil prices and back down again, and the related changes to the tanker and lightering market adjustments, along with port fees and property taxes, do not appear to have changed the order of cost advantage since 2004 and 2008. If Corpus Christi moves forward with the planned 52 foot expansion, the competitive advantage against these other Texas ports will expand significantly.

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## **The Landed Cost of Crude Oil: A Comparison of Selected Gulf Coast Ports**

### **Introduction**

The purpose of this report is to make a comparison of the costs of delivering foreign crude oil to refineries near the Gulf Coast ports at Corpus Christi (PCCA), Houston (PHA), Beaumont (PB) and Texas City (TC). The conceptual basis for the comparison is commonly known as “landed costs”. Properly defined, landed costs for the four ports constitute an “apples-to-apples” comparison to help assess the economic competitiveness of the four ports. Landed costs are defined for this study as the cost of delivery of foreign crude oil to the input side of the destination port dock. Two previous studies for PCCA have made such comparisons and have concluded that PCCA held a favorable competitive position among the competing ports on the Texas Gulf. The current report provides an update to such analyses and evaluates whether the prior evaluation results were anomalous or peculiar to the oil and shipping market conditions at the time. The basis for the comparison is landed costs, or the total cost of oil delivered to the private oil docks in the four ports under conditions of varying oil and shipping market conditions.

The central question the study addresses is whether the competitive position of the port at Corpus Christi relative to PHA, BP and TC are affected by the changing conditions of the U.S. and world oil and shipment markets. The study examines the oil market movements since 2004 as the price of imported oil has varied from an annual average \$36 per barrel in 2004 to \$93 per barrel in 2008 and back to \$69 during the first one-half of 2009. The peak spot market oil price reached a high of \$134 per barrel on July 18, 2008. By September 5, 2008 the spot market price had fallen to \$106 per barrel and to \$32 by January 2009. The tanker and lightering market prices are affected by the oil market dynamics but have their own supply and demand factors that result in market price changes for shipments both at sea and in lightering zone-to-port shipments that are related, but not in lock-step with oil market price movements. The relationship of the landed cost of oil to these several economic conditions that surround such movements in the price of crude oil are examined and evaluated as to whether they impact one port more than the others.

The factors that have to be taken into account in order to make a valid comparison among ports include 1) the price of foreign crude oil, 2) the cost of tanker transportation, 3) origin port charges and fees, 4) lightering charges at the destination port, 5) insurance costs, 6) piloting fees, 7) fire protection fees, 8) wharfage charges and 9) local taxes. Several of these factors are already included in the available price data, thus making the job of comparison simpler.

Both PCCA and PHA are in the process of completing, or have plans to expand, their ports by widening and deepening the ship channels. The current depths are Corpus Christi 45 foot, Houston 45 foot (in part), Beaumont 40 foot and Texas City 40 foot. Houston has recently completed a widening and deepening project that includes a major portion of the ship channel, but stops at the Beltway 8 Bridge which excludes several refineries from

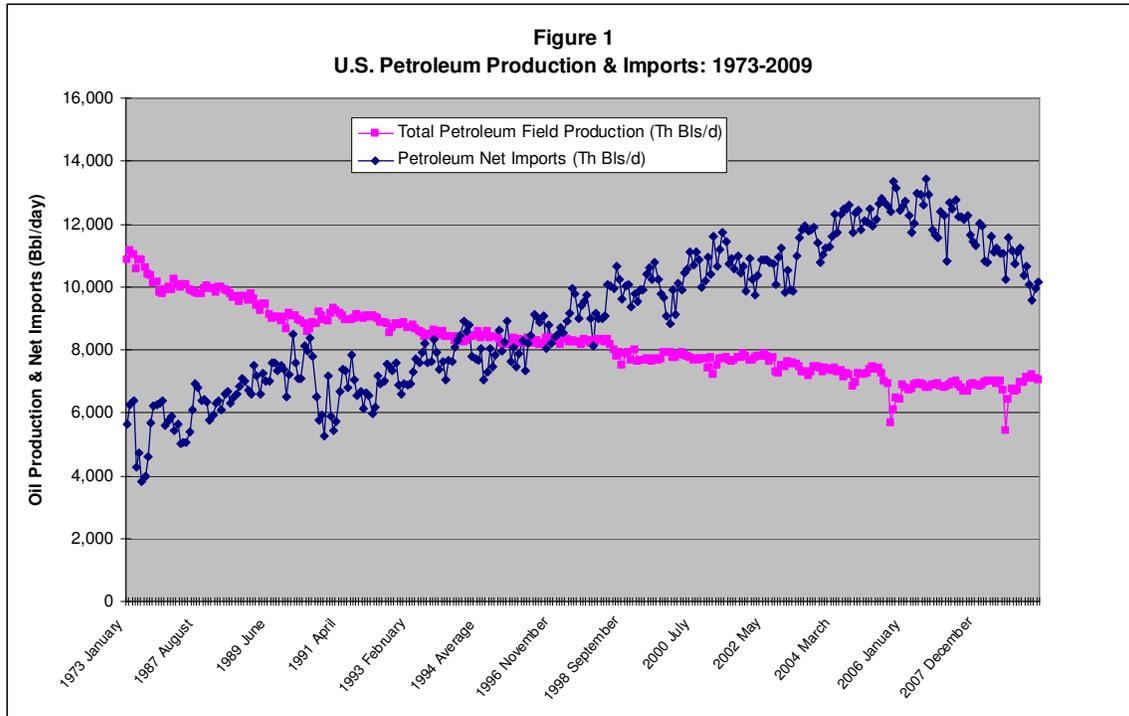
being able to benefit from the expansion. Further, the private docks along the deepened and widened portion have or will have to upgrade their docks to take advantage of the expansion. It is unclear at this date how many refiners dependent on lightering from foreign shipped crude oil will make such upgrades. If such upgrades have, or will be made, the added cost per barrel of imported oil related thereto is not available, and therefore has been excluded from the analysis. PCCA has plans to widen and deepen the Corpus Christi ship channel, and Texas City expects to complete their project to deepen the port to 45 feet to be complete in 2014.

Because of the changing and mixed depth status of the Corpus Christi, Texas City and Houston ports, several (three) cases are developed here to make comparisons of the landed cost of crude oil among the four ports. One case compares costs given expansions at Houston as though all imported oil arriving via lightering from VLCC and Suemax vessels is able to take advantage of the deeper channel. A second case restricts the advantages of the deeper Houston Ship Channel to only those refiners who have currently upgraded their docks to take advantage of the deeper channel (all of whom are downstream of the Beltway 8 Bridge). This case also recognizes that about 18% of the crude oil from foreign sources delivered to refiners on the Houston Ship Channel is delivered via pipeline from Texas City so that a weighted average landed cost of crude oil comparison needs to include these shipments carrying Texas City costs plus pipeline costs into Houston. Finally, since Corpus Christi has plans to widen and deepen the ship channel and Texas City expects to complete an expansion in 2014, comparisons are made in a third case assuming Corpus Christi and Texas City complete the planned expansions and Houston expands their project to include all refinery importers on the channel.

The following sections discuss the various factors and the data sources, including limitations and uncertainties. The final section brings the data and concepts together in a comprehensive measure of landed costs by port and makes comparisons over time in relation to the changing oil market. Comparisons are made for three foreign sources of crude and two tanker sizes, the combination of which makes up a major portion of oil imports at the four ports. The comparisons are made using early 2009 data for the updated work, and also includes comparisons of the update and the prior studies.

## **The Context of Today's Oil Import Situation**

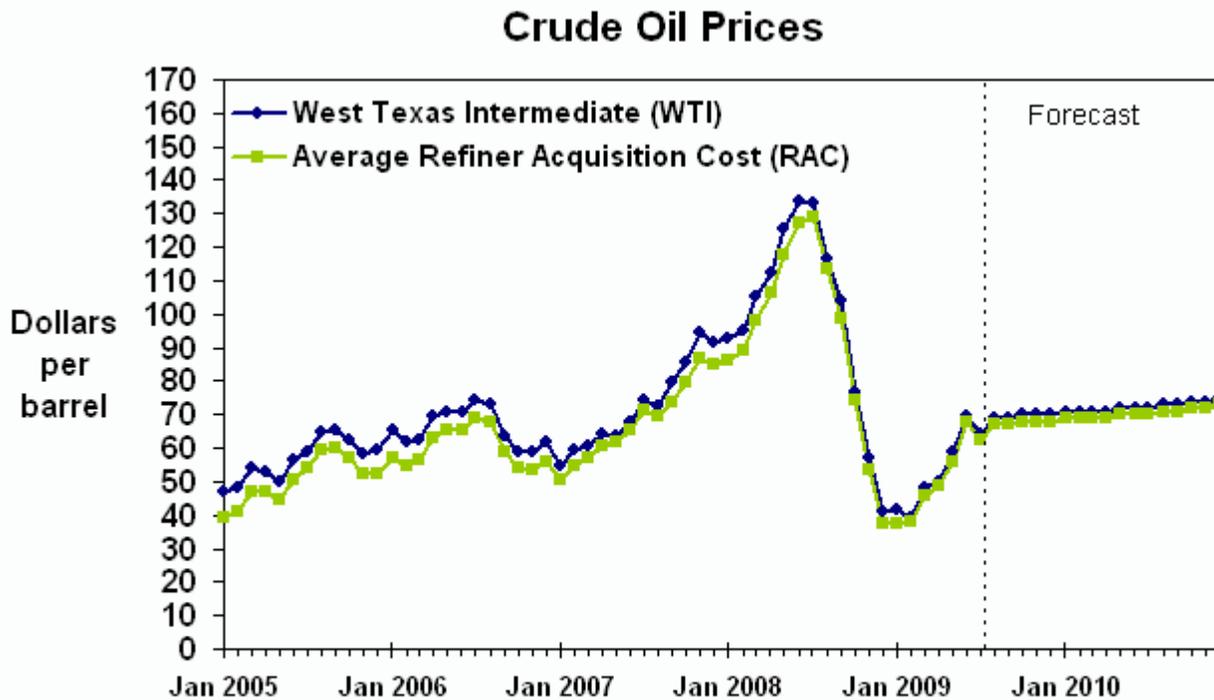
The world economy, the oil shipment market, and thus the expectations about the landed cost of crude oil on the Texas Gulf Coast are in a state of turmoil. The current recession, following on the heels of a sustained period of growth since 2002, is deep and has turned the oil boom into a period of major contractions not seen since the 1970s. The rapid economic growth of the last decade pushed oil demand and imports of liquid fuels to record highs. U.S. imports as a percent of total liquids consumption reached 60.4% in 2005 (Figure 1) when petroleum net imports reached 12.5 million barrels per day. World economic growth pressing against limited production capacity pushed world oil prices higher reaching \$134 per barrel on the spot market in mid 2008 up from \$71 per



barrel a year earlier. The high oil price combined with a financial crisis and a number of other economic factors quickly turned economic growth to a recession status in the fall of 2008. Oil demand took a sharp decline and the world oil price fell to \$32 per barrel in December 2008 (Figure 2).

The dynamics of the set of market influences has left its mark on the oil industry and related transportation sectors leaving them in a condition of contraction. Total U.S. liquids imports have fallen from the high of 12.5 million barrels per day in 2008 to 10.2 million barrels per day or 53% of total liquids consumption, down from a high of 60.4% in 2008. This rapid downward adjustment has left the market positioned to make significant adjustments. Imports are back to year 2000 levels, and prices dropped to 2004 levels of about \$32 per barrel for a short time in December 2008 before returning to levels of about \$70 per barrel in August 2009 (Figure 2). The shipping industry has been greatly affected by the combined economic expansion and contraction and these influences will continue to drive adjustments for a number of years. Perhaps the most dramatic development has been the rapid run-up and collapse of ship (asset) prices and expanded book orders for new ships. The price of VLCCs more than doubled from \$60 million in 2003 to the peak of \$140 million in 2008 (Figure 3). Prices have since fallen to about \$50 million since the 2003 peak. The cycle of ship asset adjustments is a long term process. Prices fall dramatically after a period of over booking and over production such as the current period and that of the 1970s. Assets prices have fallen, order books are being cancelled when possible and there is a rise in scrapping of older ships, all of which began with a demand decline in oil and bulk commodities. This kind of contraction has begun. In the end the available ships for transport hire will come back into balance with demand.

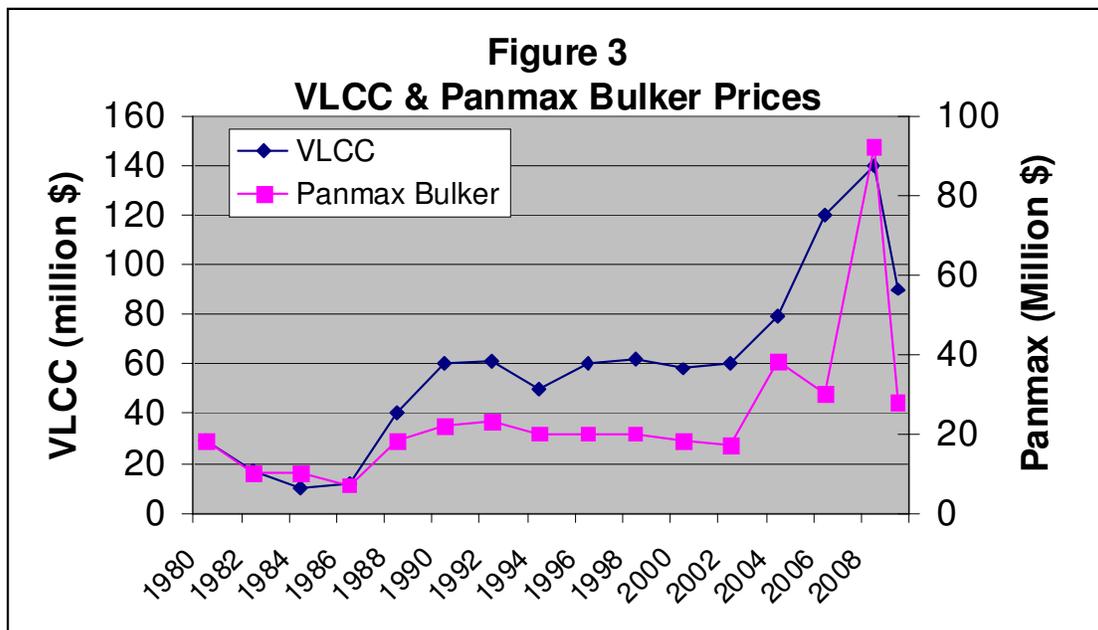
Figure 2



Short-Term Energy Outlook, August 2009



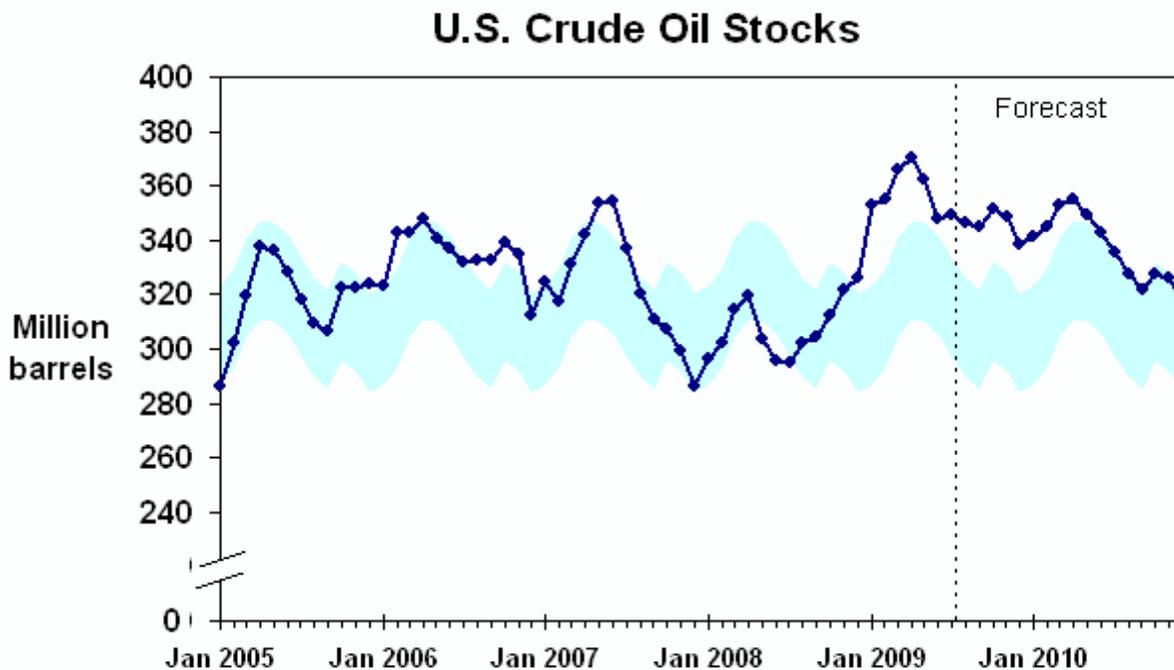
Figure 3 shows the prices of VLCC tankers and Panmax Bulkers in the shipment market.



Source: Clarkston Research Services Ltd

These two ships are representatives of the oil market on the one hand (VLCC) and the bulk container market on the other (Panmax). The world-wide recession, heavily influenced by China's expanded role in the world economy, has had a major impact on sea shipments of key materials and consumer goods. Both of these benchmark vessels have experienced a rapid run-up in price since 2002, and a sudden fall in price since mid 2008. Book orders are at historic levels with deliveries running at about 90 million deadweight tons (dwt) of capacity while the demand for new ships is at about 50 million dwt and an order book of twice that number. The adjustment to get the shipping industry back into market equilibrium will require a combination of order cancellations or delays, premature scrapping of old ships and bargain basement prices. This overhang of shipping assets will keep downward pressure on long-haul shipping rates for the foreseeable future.<sup>1</sup>

**Figure 4**



NOTE: Colored band represents "normal" range published in EIA Weekly Petroleum Status Report, Appendix A.

Short-Term Energy Outlook, August 2009



The sudden slow down in demand for oil products has left the oil industry with excess inventory of oil stocks (Figure 4) which will have to be worked down before purchases return to normal. The high inventory levels will keep downward pressure on oil imports for some time.

<sup>1</sup> Martin Stopford, Managing Director, Clarkston Research, *Forecasting – and Impossible Job?* Tradewinds Norshipping Conference, 10 June 2009.

## **Foreign Sources of Crude**

Crude oil prices on the world market reflect the quality of the crude and the transportation distance to market. The quality of the crude oil is a function of its gravity and sulfur content. Since refineries are tooled to handle a rather narrow range of crude oil qualities the U.S. Gulf Coast importers tend to buy more heavily in certain foreign markets but from a variety of foreign sources, most notably from the UK, the Persian Gulf, Africa and Venezuela.

The foreign crude oil sources selected for analysis include the Persian Gulf, Non-OPEC and Nigeria which represent the principal market segments for delivery to the Texas Gulf ports in large tankers. The average prices of crude from these sources measured as F.O.B. the origin in May 2009 were \$58.01, \$54.80 and \$57.17, respectively. These prices include port charges at the origin port. The world oil price has varied with supply and demand conditions from as low as \$10 to as high as \$134 over the last 30 years. The above prices make up the base price set for the analysis in this paper. Year 2008 data on barrels of imported crude oil by port were adopted as the base level of crude oil quantities with which to compare the size of the market by port since 2009 data are yet unavailable.

## **Transportation Costs from Origin to Destination Ports**

Crude oil tanker services are employed in the ocean shipment of crude oil in one of three ways. Some importers own their own tankers for transportation of foreign crude, but this is by no means the only means of shipment. An active spot market exists for tanker services one trip at a time. In this case the tanker owner pays the full operating costs and port fees. The more common means of ocean crude shipment is by charter tanker. In this case the user pays the market price for access to the tanker's service for a given period, and the user pays the port charges. The charter market basis was adopted for this study.

The tanker markets are very cyclical with the going market price dictated by the ebb and flow of the crude oil market, compounded by the influence of the available supply of tankers. The charter market is generally lower in price than the spot market and has varied over the last five years from a low of \$20,000 per day for VLCCs in 1999 to a high of \$230,000 for a short time during 2007. The year 2007 average was \$53,172. The smaller Suezmax tankers ranged from a low of \$16,700 per day in 1999 to \$52,769 in year 2007. Recent market prices will at most cover operating costs.<sup>2</sup> VLCCs normally

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<sup>2</sup> TANKER markets are in for another three years of poor earnings because of the massive number of newbuildings swelling global fleets, say analysts at New York-based McQuilling Services. Even with the most optimistic of outlooks on tanker demand, the analysts expect charter rates to remain low through to 2013. Tanker spot rates fell during the second quarter and the market has been in a moribund state through the third quarter, which has already led to at least one owner laying up some of its ships and others selling vessels for scrap. "Even with the best-case scenario set of aggressive assumptions, the tanker markets remain feeble in the face of fundamental tonnage oversupply," McQuilling said in a report. McQuilling forecasts that very large crude carriers will be earning \$30,500 per day and suezmax tankers about \$28,500 per day on average between 2010 and 2013.

carry about 2 million barrels of crude oil, or approximately twice that of the Suezmax class of tanker. Another popular tanker, the Aframax is experiencing major rate declines.<sup>3</sup>

### **Destination Port Charges**

VLCCs and Suezmax tankers are more economical for long distance situations than the smaller tankers, but require lightering in order to move product to refinery docks at U.S. ports. The sole Gulf Coast port exception is Louisiana Offshore Oil Port (LOOP) off the coast of Louisiana. As a general matter Suezmax tankers can be off loaded in part and then enter Gulf Coast ports; VLCCs on the other hand, have to be completely off loaded by lightering off shore (except in the case of LOOP).

The costs of lightering off-sets some, but not all, of the cost advantages of VLCC relative to Suezmax tankers for shipments from far away sources such as Saudi Arabia. The average lightering cost per barrel of oil delivered varies materially among the Gulf Coast ports analyzed in this report, due in part to the number of shuttle trips required to fully or partially off-load the cargo of the tanker, the number of round trip hours to shuttle to and from the lightering zone, and daylight restrictions on movement of large vessels. The average number of trips is also a function of the depth of the port. The price of lightering varies with market conditions very much like the market for chartered tankers for sea travel.

Two types of pricing for lightering services exist. Firms in the lightering market offer long term rates to regular large volume customers. But there is also a spot market for lightering services. The price per barrel of lightered oil ranges from a low of \$0.20 to as high as \$0.85. Current rates for delivery to PCCA range from \$0.28 to \$0.40 per barrel depending on a number of factors.<sup>4</sup> Lightering firms typically offer discounts for service to efficient ports including the Port of Corpus Christi, the Port of Houston, Texas City, Freeport and Lake Charles; a premium is added for delivery to docks in Sabine Pass and on the Mississippi where time and difficulty of maneuver is higher. The premium for Sabine and the Mississippi ports is typically 15 to 20%. The current rates for lightering in Corpus Christi, Houston, Beaumont and Texas City are estimated to be, respectively,

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The VLCC earnings may be far higher than the \$5,000 per day they were getting since July, but are much lower than the \$50,000 per day VLCCs were earning in 2007 and to the second half of 2008. Source: <http://www.lloydlist.com/>

<sup>3</sup> Venezuelan oil company PDVSA chartered three aframax crude tankers for three years each at \$18,600 per day, which represents a fall in period rates. Two months ago, Italian refinery Saras paid \$20,000 per day to hire an aframax, also for three years. By comparison, London broker Clarksons' year-to-date average period charter rate is \$21,500 per day, down a third on the 2008 average of \$30,500 per day. The fall in rates was reflected in the spot market, with the London brokerage reporting that the Mediterranean and Black Sea sectors had "gone into hibernation". The rate to hire an aframax on the Baltic Exchange TD11 route, from Baniyas to Lavera, has fallen to W65.7 or \$3,080 per day, compared to W72 or \$3,375 per day two weeks ago. Source: <http://www.lloydlist.com/>

<sup>4</sup> Tim Garfield, Valero. August 31, 2009.

\$0.413, \$ 0.523, \$ 0.594 and \$ 0.313.<sup>5</sup> Note that the rates may be lower by approximately 28% going forward as one, two and three-year lightering contracts expire and new contracts are written that reflect Aframax charter market rates.

PCCA's 45-foot channel relative to the portion of the Houston ship channel remaining at 40' and Beaumont's 40' channel gives Corpus Christi a significant current competitive advantage. Corpus Christi also has no restriction on the time of day for movements of oil tankers. The Port of Houston and Beaumont, on the other hand, restrict wide ships to daylight hours. In addition, Beaumont is at a disadvantage relative to Corpus Christi and Houston because of inefficiencies of the turning basin. Texas City is nearer to the lightering zone than the other ports but only has a 40 foot channel. An interrelated aspect is that about 45% of the imported crude oil at Texas City is off-loaded and shipped by pipeline to Exxon/Mobil and Lyondell refineries on the Houston Ship Channel. The relevant comparison of this landed cost of crude oil for comparison with Corpus Christi is therefore the off-loaded cost at Texas City plus pipeline shipment costs to Houston, plus any relevant PHA charges. The pipeline costs are estimated to be \$0.26 per barrel.<sup>6</sup>

The deepening of the Houston Ship Channel (HSC) to 45 feet makes shipments compare favorably with Corpus Christi, but it is currently uncertain as to whether all of the major private ports on the HSC will deepen their facilities to 45 feet.<sup>7</sup> Further, the expansion stops at the Beltway 8 bridge, excluding access by some major refiners. PCCA will potentially deepen the ship channel to 52 feet, an expansion that will continue to give PCCA a significant competitive advantage over other Gulf Coast ports, due in large measure to reduced lightering costs.

PCCA is compared with PHA, PB and TC in this study in three cases; (1) a 45 foot channel in PCCA relative to 45 foot PHA and 40 foot at Beaumont and Texas City as though all refiners along the deepened channel in Houston upgrade their docks, (2) a 45 foot channel in PCCA relative to 45 foot in PHA and 40 foot at Beaumont and Texas City assuming only the existing refiners along the deepened channel that have upgraded their docks will do so, but that a weighted average landed cost of crude oil from the two taker sizes include pipeline based crude oil shipped from Texas City and (3) a 52 foot PCCA channel relative to a 45 foot channel at PHA and TC, and a 40 foot channel at PB.

The per-barrel lightering costs calculated in this study are based on estimated travel time from the lightering zone to port,<sup>8</sup> and port time for lightering vessels and vessel operating costs capable of navigating each port (given the above channel depths) from the U.S.

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<sup>5</sup> Average of latest six lifts at March 2008 (Conversation with Mr. Cameron Kehens, Skaugen PetroTrans, Inc. March 9, 2008) adjusted to current July 2009 levels amounting to a conservative 16.7% decline in Gulf lightering rates (Clayton Wrenn, OSLG, August 28, 2009).

<sup>6</sup> Marcova, Inc., Pipeline Rates on Crude Petroleum, May 31, 1983 and National Petroleum Council, Petroleum Liquids Transportation, April 1989 and FERC Oil Pipeline Index for 2009.  
<http://www.ferc.gov/industries/oil/gen-info/pipeline-index.asp#skipnavsub>

<sup>7</sup> Email from Jerry Thibeaux, Senior Project Manager, Goldston Engineering, Inc., March 26, 2008. The refinery and petrochemical industry will initiate and pay for their own deepening to 45 feet at their docks. No changes have occurred since early 2008 (Email from Jerry Thibeaux, CH2M HILL September 8, 2009).

<sup>8</sup> The common lightering zone for newer double-hull tankers is off Galveston at N28-35; W94-15.

Army Corp of Engineer's analysis of the PCCA proposed port-expansion project adjusted to reflect current market conditions.<sup>9</sup> A ten- percent premium was added to the costs at Beaumont to account for the slow turn-around time relative to PCCA and PHA. An average of 3 hours wait time was added to Houston lightering time to account for the delay time due to daylight-hours-only movement<sup>10</sup>. The range of lightering costs estimated for the various conditions, ports and tankers evaluated in this study under current port depths is from \$0.413 to \$0.594 per barrel for VLCCs. Spot market and new contract prices are significantly lower than these estimates of the average going as low as \$0.28 per barrel<sup>11</sup>.

The lightering costs per barrel should decline for PCCA, PHA and TC when expansions are completed. The lightering costs reported here include all port fees, piloting and tug costs of moving the oil from the offshore vessel to the dock. The shipper incurs additional demurrage costs if delays extend the hours of operation beyond the maximum specified in the lightering agreement. In addition, the wharfage fee at PCCA and Texas City is passed through to the shipper.

Wharfage for the four ports differs because of differences in negotiated rates and depending on whether the docks are private or public assets. PCCA owns some of the oil dock capacity while private owners make up a major share. PCCA charged a \$0.0415 per barrel wharfage plus security fee on oil delivered at private docks and \$0.0831 for public docks during 2008. A security surcharge was added by PCCA in 2004, put in gradually over time, reaching 12% for 2008 but has subsequently been reduced to 10% effective January 2009. The 2009 wharfage plus security fee for private docks is \$0.0413 per barrel. PHA and PB have only private docks for handling crude oil tankers and have no wharfage fee for these private crude oil docks. Texas City has a two-part wharfage fee amounting to \$0.0906 per barrel for non-leased docks and \$0.0576 per barrel for leased docks. A \$0.03 per barrel surcharge was added in 2009 to pay for the 45 foot channel.<sup>12</sup> The expansion is projected to be complete in 2014.<sup>13</sup>

The Port of Houston assesses a property tax on all real property in the district, including the private oil docks and the refinery/petrochemical complexes they serve. This property tax is a major revenue producer for PHA and the refinery/petrochemical plants constitute a significant share of the tax base. These property tax amounts to a cost of \$0.003 per barrel of imported oil going over the private docks<sup>14</sup>.

Insurance and fire protection fees were ignored, but expected to be approximately the same per barrel of imported oil among the four ports.

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<sup>9</sup> U.S. Army Corp of Engineers, Corpus Christi Ship Channel Economic Benefit Analysis, Economic Appendix, 4 April 2003.

<sup>10</sup> Conversation with Mr. Mike Kershaw, Corpus Christi pilot, July 23, 2004.

<sup>11</sup> Tim Garfield, Valero. August 31, 2009.

<sup>12</sup> PORT OF TEXAS CITY TEXAS CITY TERMINAL RAILWAY COMPANY U.S. CUSTOMS PORT CODE 5306 CIRCULAR NO. 4-H.

<sup>13</sup> <http://www.texas-city-tx.org/EconomicDevelopment.htm>

<sup>14</sup> Port of Houston property tax rates from web page at [http://www.springvalleytx.com/business/documents/TaxRateFactsOctober2007\\_000.pdf](http://www.springvalleytx.com/business/documents/TaxRateFactsOctober2007_000.pdf)

## Analysis Results

The analysis summarized in this report compares the landed costs of crude oil delivered to private docks at PCCA, PHA, PB and TC. Since the markets for foreign crude oil, oil tankers, lightering services, piloting, and tug services vary significantly with market conditions a number of standardizing assumptions were adopted to allow an “apples-to-apples” comparison of the competitive position of PCCA relative to selected Gulf Coast port alternatives. The foreign crude oil prices were based on May 2009 average prices for three major foreign sources at the port of origin (F.O.B.). The average costs for chartered tankers (VLCC and Suezmax) were adopted to calculate the average transportation cost from foreign sources to the selected Gulf Coast lightering zone based on the decline from 2008 to mid 2009 as measured by the Clarkston Index.<sup>15</sup> Costs for lightering by vessel class and port depth was based on U.S. Army Corp of Engineers study referenced above, adjusted to account for current market conditions. Piloting and tug costs were included in the lightering fee rates.

The volatility of the oil and tanker markets carries over to the lightering market so that the long term level of rates per barrel for lightering are uncertain. It is clear, however, that as recent oil prices that have risen from about \$25 per barrel in 2002 to \$134 per barrel in the summer of 2008 and then fell to \$32 per barrel before returning to pre-2007 levels of about \$69 currently, and diesel prices have consequently followed the oil market, and the cost of operating lightering ships rose rapidly until mid 2008. Following 2002 lightering prices rose by about 20% and then declined in 2009 by about 25% to near 2004 levels. Fuel costs are not the whole story, of course, since the supply of firms, and the capacity of existing firms come and go from the industry in response to market conditions. As lightering costs have changed the importance of this factor on the economics of operating in Corpus Christi relative to Houston and Beaumont/Port Arthur has also changed. Current lightering rates have risen in Corpus Christi from about \$0.39/bbl in 2002 to \$0.50/bbl in early 2008 and an estimated \$0.413 in mid 2009. Deepening the channel to 52 feet would lower the cost of delivering a VLCC load to port by about \$0.17/bbl since the number and size of lightering lifts would be reduced significantly for a VLCC load. Lightering cost would decline by about \$0.15/bbl for Suezmax loads.

The comparison of landed costs is reported here in five tables at the end of the paper. Tables 1 and 2 show the landed cost comparison of the four ports with delivery via VLCC and Suezmax tankers, respectively, to private ports given the channel depths of 45 foot for PCCA and PHA and 40 foot for PB and TC. Tables 3 and 4 compare PCCA with PHA and PB private docks for the two classes of vessels given 52-foot channel for PCCA, 45 foot for PHA and 40 foot for PB and 45 foot for TC. Table 5 summarizes the difference in landed costs by tanker class and scenario of port depth, given assumptions about whether certain refiners will upgrade their docks.

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<sup>15</sup> Clarkston Index= weighted average of earnings by tankers, bulkers, containers & gas, Clarkston Research Services Ltd

Since the common practice is to lighter tankers from a common lightering zone off Galveston, at any given market condition in the world oil and charter tanker markets, the primary factor that dictates the competitive advantage among the Texas ports is the cost of lightering.<sup>16</sup> The cost of lightering is dependent primarily on the hours of travel, port time and the number of shuttle trips required to lighter the tanker. The number of shuttle trips depends on the tanker size and channel depth to port. Deeper channels allow larger shuttle vessels/heavier loads.

The other differences among the ports include the property tax levied by PHA, wharfage fees at PCCA and TC and wait times due to crowding and daylight moving restrictions at PHA and PB. For comparison the PCCA wharfage fee on private docks is \$0.04 per barrel, plus a 10% security surcharge, the property tax at PHA amounts to \$0.003 per barrel and the extra wait time at PHA due to daylight movement restrictions adds to the cost at PHA. Texas City has a two-part wharfage fee amounting to \$0.0906 per barrel for non-leased docks and \$0.0576 per barrel for leased docks after adding a \$0.03 per barrel surcharge since the 2008 study.

### **Existing Port Conditions**

After accounting for changes following the 2008 study Corpus Christi has a competitive advantage of \$0.072 per barrel with Houston in Case I for VLCC and \$0.023 per barrel for Suezmax tanker sizes. The comparison of Corpus Christi with Houston is based on the current distribution of all Suezmax and VLCC crude oil imports among the major importers as though all the barrels imported take advantage of the expanded port depths based on current average lightering rates. So this comparison applies to some refineries on the Houston ship channel but not to the average. The Corpus Christi advantage for Corpus Christi relative to Beaumont is \$0.143 for VLCC and \$0.072 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.034 for VLCC and \$0.074 for Suezmax.

Case II contrasts Corpus Christi with Houston but recognizes that the Houston Ship Channel has been expanded only up to the Beltway 8 bridge and that not all private docks have been upgraded to take advantage of the PHA widening and deepening project, namely Shell, ITC and VOPAK docks do not appear to have been upgraded and thus continue to experience shipment costs based on a 40 foot channel. In addition, Case II recognizes that about 18% of Houston refinery input from foreign sources is delivered by way of pipeline from Texas City at lower costs than direct shipments via the Houston Ship Channel. The Case II comparison between Corpus Christi and Houston uses a weighted average landed cost estimate for Houston based on lightering cost for volumes through the 40 foot deep channel, lightering cost for volumes through the 45 foot channel and volumes delivered via pipelines from Texas City.

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<sup>16</sup> There is also an important difference in direct shipment costs from Mexico via smaller tankers that move port to port, that reflect the difference in transportation hours, port hours and size of tanker able to navigate the ports. Year 2004 rates for direct shipments were: New Orleans, \$3.55/bbl; Houston, \$2.97; Texas City, \$2.81; and Corpus Christi, \$2.62. Corpus Christi had a \$0.35 advantage over Houston, due mostly to the depth of port and efficiency of movement in and out of port.

In Case II Corpus Christi has a competitive advantage with Houston amounting to \$0.159 per barrel for the VLCC class ship and \$0.085 for the Suezmax. The comparisons of Corpus Christi with Beaumont and Texas City are the same as in Case I.

Case III assumes a pending decision takes place by PCCA to expand the channel from 45 feet to 52 feet and that Texas City completes their expansion as scheduled for 2014. If the Corpus Christi planned expansion proceeds Corpus Christi will expand its competitive advantage with Houston to a \$0.239 per barrel advantage for VLCC and \$0.176 for Suezmax. The advantage for Corpus Christi relative to Beaumont is \$0.306 for VLCC and \$0.224 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.067 for VLCC and \$0.150 for Suezmax.

The over-all costs of all port services at PCCA for VLCC vessels amounts to between 0.769% and 0.817% of the landed costs (depending on the foreign source) as compared to 0.890% to 0.946% for PHA and between 1.009% to 1.072% for PB (Table 1). For the smaller Suezmax tanker which needs less lightering, the costs at PCCA amounts to 0.425% to 0.452% (depending on the foreign source) and 0.464% to 0.493% for PHA (Table 2).

Table 1 and 2 may represent the long term differences between Corpus Christi and Houston, but no doubt understate the current differences. This is the case because the Houston estimates in Tables 1 and 2 assume that current average landed costs of foreign crude oil arriving via VLCC and Suezmax tankers apply to all barrels imported by the refiners on the Houston Ship Channel. Two adjustments are needed to estimate a more representative average for purposes of comparison with averages in Corpus Christi and the other ports. On the one hand oil shipments to the refiners located upstream of the Beltway 8 bridge are incurring lightering costs associated with 40 foot depths rather than the 45 foot depths represented in Tables 1 and 2. Such lightering costs are estimated to be \$0.914 per barrel rather than \$0.523 for importers using the 45 foot channel capacity. On the other hand refiners upstream of the Beltway 8 Bridge are receiving crude via pipeline from Texas City at an estimated lightering plus pipeline costs of \$0.636 per barrel. The lightering cost for barrels received on the downstream section of the ship channel is \$0.523. A weighted average of the rates amounts to an average lightering (plus pipelining cost) of \$0.58 per barrel compared with \$0.413 in Corpus Christi for the VLCC class.

The results of Tables 1 and 2 and the weighted average discussed in the previous paragraph are used to construct the difference calculations summarized in for Cases I and II in Table 5. Case II of Table 5 is a weighted average of the data from Tables 1 and 2 plus the weighted averages summarized in the previous paragraph. In Case II the weights are 16% upstream of the Beltway 8, 67% downstream of Beltway 8 and 18% by pipeline from Texas City.<sup>17</sup> Case I assumes all private docks receiving the long distance foreign crude along the expanded channel make dock upgrades. Case II assumes that only

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<sup>17</sup> Imported crude oil and unfinished liquids in January 2008 by company and country of origin delivered to Houston. Source: Energy Information Administration (EIA) at [http://tonto.eia.doe.gov/dnav/pet/pet\\_move\\_impcus\\_a2\\_nus\\_ep00\\_im0\\_mbb1\\_m.htm](http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbb1_m.htm).

existing private docks that have upgraded do so and that pipeline volumes from Texas City carry Texas City Port costs plus pipeline costs to Houston.

### **PCCA Port Expansion**

The competitive advantage of PCCA private docks relative to PHA, PB and TC will increase with the deepening and widening of the ship channel. Lightering costs will be significantly decreased for Corpus area crude oil shippers because the Suezmax size tankers will be able to enter the port fully loaded thus avoiding lightering costs. VLCC shippers will also benefit because the number of lightering trips per loaded VLCC will decrease. Further, the port expansion will encourage a change in the mix of tankers increasing the share of larger tankers thus reducing the total landed costs of imported crude oil; the effects of this shift have been ignored in this analysis that is structured to examine the PCCA competitive cost advantage by focusing on the cost of shipment from three sources and two tanker sizes.

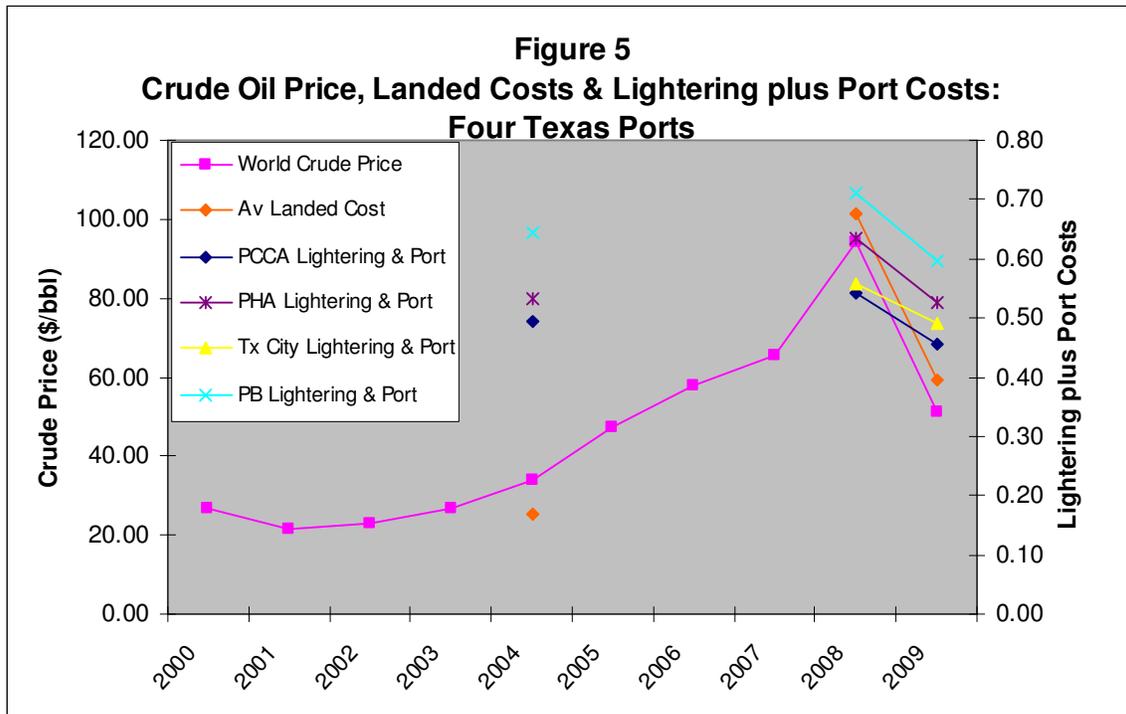
The competitive advantage of Corpus Christi would expand if the Corpus Christi Ship Channel is deepened and widened as planned where the deepening expands the channel from 45 feet to 52 feet. If the Corpus Christi planned expansion proceeds Corpus Christi will expand its competitive advantage with Houston to a \$0.239 per barrel advantage for VLCC and \$0.176 for Suezmax. The advantage is greater for Corpus Christi relative to Beaumont at \$0.306 for VLCC and \$0.224 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.067 for VLCC and \$0.150 for Suezmax after considering the TC reduced cost with the completed 45 foot channel. (Tables 3 and 4).

The over-all costs of all port services at PCCA for VLCC vessels amounts to between 0.487% and 0.518% of the landed costs (depending on the foreign source) as compared to 0.890% to 0.946% for PHA and between 0.990% to 1.059% for PB (Table 3). For the smaller Suezmax tanker which needs less lightering, the costs at PCCA amounts to 0.166% to 0.177% (depending on the foreign source) and 0.464% to 0.493% for PHA (Table 4).

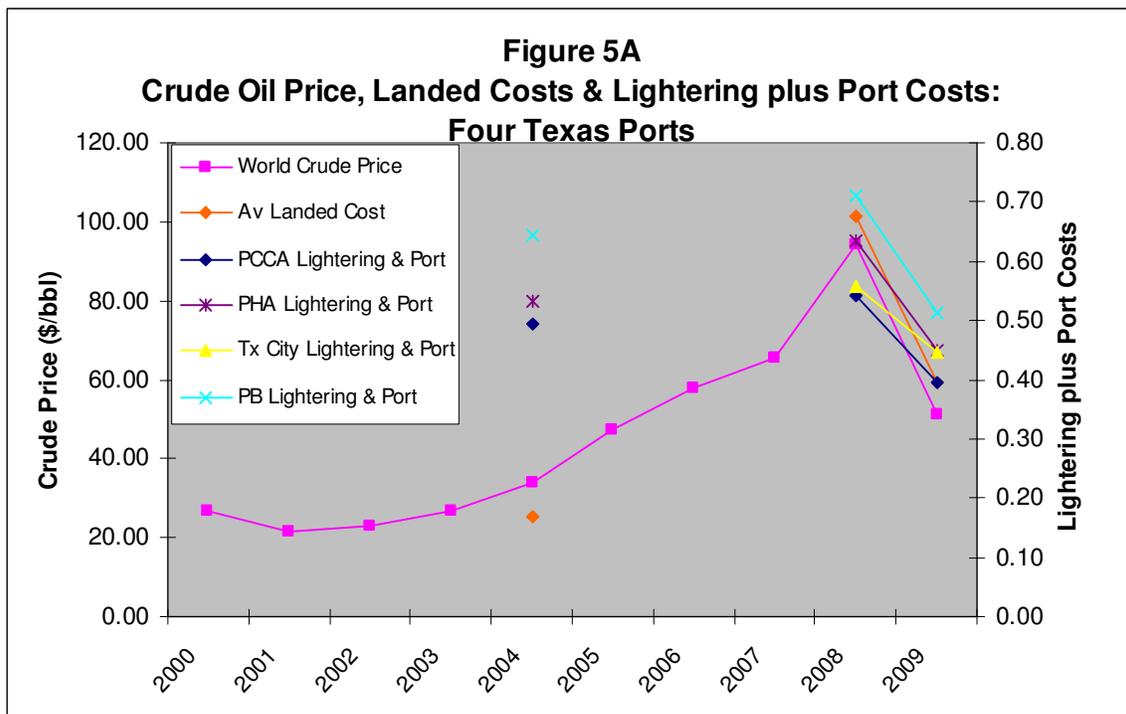
Table 5 summarizes the cost advantages of PCCA relative to PHA, PB and TC in Case III. The summary shows the importance of PCCA's competitive advantage relative to depth and 24 hour access and the importance of the planned expansion to maintain competitiveness. The tanker sizes and foreign sources emphasize the ability to remain competitive for shipments of Persian Gulf, Non-OPEC and Nigerian oil sources.

### **Comparisons Over Time**

The changes in world crude oil prices, charter vessel shipping rates, lightering prices, wharfage rates and property taxes (Figure 5) have affected the landed cost of crude oil delivered to refineries on the Gulf Coast. The competitive position of Corpus Christi relative to Houston, Beaumont and Texas City has not changed significantly. Figure 5 shows the relationship between the price of crude oil, the landed costs and the lightering plus port charge costs among the four ports since 2004.



The estimated lightering cost shown in Figure 5, however represent current averages where existing one, two and three-year contracts continue to reflect market rates over the



last two years. As these contracts expire and new ones take their place at going market rates, the average price is expected to decline. Figure 5A shows a likely case where lightering rates decline by approximately 30% since early 2008. But these further declines are expected to impact overall lightering rates for all the ports. The net effect, however, will reduce the PCCA competitive advantage somewhat since as lightering rates fall the PCCA and Texas City wharfage impact becomes a larger part of the total. At these rates PCCA will still hold an advantage in both vessel classes for Case I, Case II and Case III.

## Conclusions

A number of factors influence the landed cost of crude oil at PCCA, PHA and PB, including the price of foreign crude oil, the cost of tanker transportation, lightering charges at the destination port, piloting fees, tug fees, wharfage charges and property taxes. The most important of the factors at the destination port is the cost of lightering. VLCCs require all of the cargo to be discharged to lightering vessels for delivery to port. Smaller Suezmax tankers require only about one-half of the cargo to be lightered under current port conditions. The channel depth plays a significant part in the final landed cost, mostly because of the effects on lightering costs; deeper channels require less lightering. Because of PCCA's distance disadvantage from the lightering zone maintaining a deeper channel is an important factor in remaining competitive with the most efficient of the Gulf Coast ports.

The competitive advantage of Corpus Christi relative to Houston, Beaumont and Texas City are indicated by way of comparison of crude oil delivery costs for two particular tanker sizes that deliver a major portion of imported crude oil. The two dominant tanker sizes for foreign shipments include the VLCC, approximately 2.0 million-barrel capacity, and the Suezmax, approximately 1.0 million-barrel capacity. Further, since there are alternative port depths to consider at PCCA and since the recent expansion at Houston has not resulted in the deeper 45 foot water being available to major refiners three alternative case comparisons were made.

Case I contrasts Corpus Christi with Houston, Beaumont and Texas City with port depths as the ports currently exist but assuming the Houston deepening project eventually results in all refiners having access to the 45 foot water. Case II is a separate version of Case I that recognizes that the entire length of the Houston Ship Channel has not been expanded to 45 feet and that not all importers of crude oil have expanded their docks to take advantage of the deeper channel. Case III compares estimated costs at Corpus Christi with the other ports where the Corpus Christi and Texas City ship channels have been deepened to 52 and 45 feet, respectively.

Corpus Christi has a competitive advantage of \$0.072 per barrel with Houston in Case I for VLCC and \$0.023 per barrel more for Suezmax tanker sizes. In Case II Corpus Christi has a competitive advantage with Houston amounting to \$0.159 per barrel for the VLCC class ship and \$0.085 for the Suezmax. The comparisons of Corpus Christi with Beaumont and Texas City are the same as in Case I.

In Case III Corpus Christi planned expansion increases PCCA's competitive advantage with Houston to a \$0.239 per barrel advantage for VLCC and \$0.176 for Suezmax. The advantage for Corpus Christi relative to Beaumont is \$0.306 for VLCC and \$0.224 for Suezmax. The Corpus Christi advantage relative to Texas City is \$0.067 for VLCC and \$0.150 for Suezmax.

In summary, Corpus Christi has a significant competitive advantage in the delivery cost per barrel for foreign crude oil shipments via large tankers when compared to Houston, Beaumont and Texas City. If Corpus Christi moves forward with the planned 52 foot expansion, the competitive advantage against these other Texas ports will expand significantly.

**Table 1. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks (VLCC Tanker): PCCA & PHA at 45, PB & TC at 40 Feet with Pipeline to Houston Ship Channel**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**			
	PCCA Totals	Persian Gulf	Non-OPEC	Nigeria	PHA Totals	Persian Gulf	Non-OPEC	Nigeria	PB Totals	Persian Gulf	Non-OPEC	Nigeria	Tx City Totals**	Persian Gulf	Non-OPEC	Nigeria
Crude Oil Imports (2008 th short tons)	25,041				50,894				44,748				18,030			
F.O.B. Costs (Origin) May 2009		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17
Charter Tanker Cost from Origin		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438
Tariff (Wharfage & Handling Charges)		0.0413	0.0413	0.0413		-	-	-		0.004	0.004	0.004		0.0576	0.0576	0.0576
Lightering (incl piloting & tug costs)*		0.413	0.413	0.413		0.523	0.523	0.523		0.594	0.594	0.594		0.313	0.313	0.313
Port Property Taxes on the Refiner		-	-	-		0.003	0.003	0.003								
Pipeline Charge (Offshore to Port of Importation)														0.12	0.12	0.12
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.454	0.454	0.454		0.526	0.526	0.526		0.597	0.597	0.597		0.488	0.488	0.488
Calculated Refiners Acquisition Costs		59.070	55.56	58.06		59.14	55.64	58.13		59.21	55.71	58.21		59.10	55.60	58.10
Port Charges (incl lightering) as Percent of Refiners Cost		0.769%	0.817%	0.782%		0.890%	0.946%	0.905%		1.009%	1.072%	1.026%		0.826%	0.878%	0.840%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.

\* Lightering prices include the cost of tug, piloting and other port costs.

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of the two parts. Wharfage rate is that for leased docks.

**Table 2. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks ( Suezmax Tanker): PCCA & PHA at 45, PB & TC at 40 Feet with Pipeline to Houston Ship Channel**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**			
	PCCA Totals	Persian Gulf	Non-OPEC	Nigeria	PHA Totals	Persian Gulf	Non-OPEC	Nigeria	PB Totals	Persian Gulf	Non-OPEC	Nigeria	Tx City Totals**	Persian Gulf	Non-OPEC	Nigeria
Crude Oil Imports (2008 th short tons)	25,041				50,894				44,748				18,030			
F.O.B. Costs (Origin) May 2009*		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17
Charter Tanker Cost from Origin		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438
Tariff (Wharfage & Handling Charges)		0.0413	0.0413	0.0413		-	-	-		0.004	0.004	0.004		0.0576	0.0576	0.0576
Lightering (incl piloting & tug costs)*		0.209	0.209	0.209		0.270	0.270	0.270		0.318	0.318	0.318		0.149	0.149	0.149
Port Property Taxes on the Refiner		-	-	-		0.003	0.003	0.003								
Pipeline Charge (Offshore to Port of Importation)														0.12	0.12	0.12
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.250	0.250	0.250		0.273	0.273	0.273		0.322	0.322	0.322		0.324	0.324	0.324
Calculated Refiners Acquisition Costs		58.87	55.36	57.86		58.89	55.38	57.88		58.94	55.43	57.93		58.94	55.43	57.93
Port Charges (incl lightering) as Percent of Refiners Cost		0.425%	0.452%	0.432%		0.464%	0.493%	0.472%		0.546%	0.580%	0.555%		0.550%	0.584%	0.559%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.

\*Lightering prices include the cost of tug, piloting and other port costs.

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of the two parts. Wharfage rate is that for leased docks.

Table 3. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks (VLCC Tanker): PCCA at 52, PHA at 45 & PB & TC at 45 Feet with Pipeline to Houston Ship Channel

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**			
	PCCA Totals	Persian Gulf	Non-OPEC	Nigeria	PHA Totals	Persian Gulf	Non-OPEC	Nigeria	PB Totals	Persian Gulf	Non-OPEC	Nigeria	Tx City Totals**	Persian Gulf	Non-OPEC	Nigeria
Crude Oil Imports (2008 th short tons)	25,041				50,894				44,748				18,030			
F.O.B. Costs (Origin) May 2009*		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17
Charter Tanker Cost from Origin		0.606	0.309	0.438		0.606	0.309	0.438		1.328	0.677	0.961		0.606	0.309	0.438
Tariff (Wharfage & Handling Charges)		0.0413	0.0413	0.0413		-	-	-		-	-	-		0.0576	0.0576	0.0576
Lightering (incl piloting & tug costs)*		0.246	0.246	0.246		0.523	0.523	0.523		0.594	0.594	0.594		0.179	0.179	0.179
Port Property Taxes on the Refiner		-	-	-		0.003	0.003	0.003								
Pipeline Charge (Offshore to Port of Importation)														0.12	0.12	0.12
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.29	0.29	0.29		0.53	0.53	0.53		0.59	0.59	0.59		0.35	0.35	0.35
Calculated Refiners Acquisition Costs		58.90	55.40	57.90		59.14	55.64	58.13		59.93	56.07	58.72		58.97	55.46	57.96
Port Charges (incl lightering) as Percent of Refiners Cost		0.487%	0.518%	0.496%		0.890%	0.946%	0.905%		0.990%	1.059%	1.011%		0.600%	0.638%	0.610%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on mileage differential.

\*Lightering prices include the cost of tug, piloting and other port costs.

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of the two parts. Wharfage rate is that for leased docks.

Table 4. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks ( Suezmax Tanker): PCCA at 52 Feet; PHA at 45 & PB & TC at 45 Feet with Pipeline to Houston Ship Channel

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**			
	PCCA Totals	Persian Gulf	Non-OPEC	Nigeria	PHA Totals	Persian Gulf	Non-OPEC	Nigeria	PB Totals	Persian Gulf	Non-OPEC	Nigeria	Tx City Totals**	Persian Gulf	Non-OPEC	Nigeria
Crude Oil Imports (2008 th short tons)	25,041				50,894				44,748				18,030			
Crude Oil Imports (2008 th bbls)	183,552				373,055				328,002				#####			
F.O.B. Costs (Origin) May 2009*		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17		58.01	54.80	57.17
Charter Tanker Cost from Origin		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438		0.606	0.309	0.438
Tariff (Wharfage & Handling Charges)		0.0413	0.0413	0.0413		-	-	-		0.004	0.004	0.004		0.0576	0.0576	0.0576
Lightering (incl piloting & tug costs)*		0.056	0.056	0.056		0.270	0.270	0.270		0.318	0.318	0.318		0.073	0.073	0.073
Port Property Taxes on the Refiner		-	-	-		0.003	0.003	0.003								
Pipeline Charge (Offshore to Port of Importation)														0.12	0.12	0.12
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.097	0.097	0.097		0.273	0.273	0.273		0.322	0.322	0.322		0.248	0.248	0.248
Calculated Refiners Acquisition Costs		58.71	55.21	57.71		58.89	55.38	57.88		58.94	55.43	57.93		58.86	55.36	57.86
Port Charges (incl lightering) as Percent of Refiners Cost		0.166%	0.177%	0.169%		0.464%	0.493%	0.472%		0.546%	0.580%	0.555%		0.421%	0.448%	0.428%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on mileage differential.

\*Lightering prices include the cost of tug, piloting and other port costs.

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of the two parts. Wharfage rate is that for leased docks.

**Table 5. Summary of Landed Cost Differences Between Corpus Christi, Houston, Beaumont and Texas City: Private Oil Docks: Two Tanker Classes**

	Corpus Christi & Houston		Corpus Christi & Beaumont		Corpus Christi & Texas City	
	VLCC	Suezmax	VLCC	Suezmax	VLCC	Suezmax
Case I. Houston Deepened Channel Depths to Beltway 8: Current Average Lightering Costs (Corpus 45', Houston 45' Beaumont 40' & Tx City 40')	-\$0.072	-\$0.023	-\$0.143	-\$0.072	-\$0.034	-\$0.074
Case II. Houston Deepened Channel Depths to Beltway 8: Weighted Average Where Shell, ITC & VOPAK do not Upgrade Docks & Including Pipeline Deleveries from Texas City (Corpus 45', Houston 40' - 45' & Beaumont 40' & Tx City 40')	-\$0.159	-\$0.085	-\$0.143	-\$0.072	-\$0.034	-\$0.074
Case III. Planned Corpus Christi and Texas City Channel Depths (Corpus 52', Houston 45' & Beaumont 40' & Tx City 45')	-\$0.239	-\$0.176	-\$0.306	-\$0.224	-\$0.067	-\$0.150

## Appendix A Key Data Items and Assumptions

Data, Parameters and Assumptions							
	mmbtu/bbl	MT/bbl	ST/bbl	Lg/bbl	Bbl/ton	Long ton	Short ton
<b>Crude Oil Conversions</b>	5,800,000	0.136	0.15	0.1339	7.33	2240	2000
			<b>Charter Cost/bbl (2007 prices)</b>				
<b>Distance from Lightering Zone to:</b>	Nautical miles	Days travel time w return	VLCC	Suezmax			
Ad Dammam, Saudi Arabia	9,864	54.8	\$0.6055	\$1.2019			
London, England	5,030	27.9	\$0.3088	\$0.6129			
West Africa	7,137	39.7	\$0.4381	\$0.8696			
<b>Travel Time from Lightering Zone to:</b>		<b>Hours</b>	<b>Average Cost of Lightering/Bbl of Tanker Delivery</b>				
Corpus Christi Pilot Station		14	\$0.4129	\$0.2087			
Beaumont Pilot Station		6	\$0.5935	\$0.3179			
Houston Pilot Station		4	\$0.9141	\$0.4896			
Texas City Pilot Station		4	\$0.1791	\$0.1110			
Source: Phone conversation Skaugen PetroTrans 3/14/08							
<b>PHA Property Tax Rate (\$/100 Valuation)</b>	Based on Total Refinery & Chemical Valuation/bbl of Imports						
Tax rate (real property)	0.01233						
Tax per bbl	0.00294						
Source: <a href="http://www.portofhouston.com/">http://www.portofhouston.com/</a>							
<b>Charter Rate (\$/day)</b>	Sept 06-Mar 2007	Mar-Sept 07					
VLCC (modern)	24,246	20,588					
Suezmax (modern)	24,063	19,611					
Source: Clarkson data as reported in Oil & Gas Journal, Jan. 2008 adjusted by Clarkston Index to July 2009							
<b>Tanker Capacity</b>	Dwt	Bbl	Av Cap Discount for Ballast				
VLCC	320,000	2,194,225	93.3%				
Suezmax	160,000	1,097,112	93.3%				
Source: IRS Manual, Oil and Gas Handbook, Chapter 7, p.8 @ <a href="http://www.irs.ustreas.gov/businesses/index.html">http://www.irs.ustreas.gov/businesses/index.html</a>							
	Dwt	Bbl	Draft				
Lightering Vessel PCCA	98,805	677,503	44.4				
Lightering Vessel PHA	99,320	550,096	39.0				

Data, Parameters and Assumptions (Conti)						
<b>Tanker Dimensions</b>	Length	Width	Draft			
VLCC	1094	190	73.8			
Suezmax	967	166	55.8			
Source: <a href="http://www.ship-technology.com/projects/iran_delvar/">http://www.ship-technology.com/projects/iran_delvar/</a>			Source: <a href="http://www.businessintexas.com/sabinepilots/rates_fees.htm">http://www.businessintexas.com/sabinepilots/rates_fees.htm</a>			
<b>Tanker Speed</b>	knots: Sea Travel	knots: Channel Travel				
VLCC	15					
Suezmax	15	12	Docking & Off Docking			
			Shifting in Turning Basin			
<b>U.S. Refinery Crude Inputs (2002)</b>			Total			
Total	5,535,805					
Imports	3,302,012					
Capacity Utilization	90.3%			<b>PCCA Lightering Costs/Bbl</b>	<b>Annual costs (\$ mil)</b>	<b>Annual vol (mil bbl)</b>
% Imports	59.6%			\$ 0.4129	\$ 160	401.5
						<b>Beaumont Premium</b>
						15%
				Source: <a href="http://www.skaugenonline.com/">http://www.skaugenonline.com/</a>		
<b>Wharfage per Bbl</b>	<b>Private Docks</b>	<b>Public Docks</b>	<b>Port Depth</b>	& Phone conversation 3/14/08		
PCCA	0.0413	0.0826	45			
PHA	0.000	0.000	40-45			
PB	0.00375	0.00375	40			
Texas City Port (leased and non-leased)	0.0576	0.0906	40-45			
Sources: PCCA, Tariff 100-A; PHA, Tariff No.-9						

Data, Parameters and Assumptions (Conti)							
<b>Definitions</b>							
<b>Time-Charter:</b>							
Lease of a ship to a charterer for a period of time rather than for the performance of a specific voyage. An elemental version of this arrangement, called a bare boat charter, works like renting an unfurnished apartment. The charterer must provide his own master and crew. In other cases the owner provides personnel and various services.							
<b>Spot Charter:</b>							
Arrangement for a ship to carry a certain cargo on a particular route. Such deals, sometimes called voyage charters, usually cover a single trip. Commitments for two or more consecutive voyages do happen, though, occasionally. In a spot charter, the shipowner pays							
<b>Deadweight tonnage (DWT):</b>							
The standard measure of ships' carrying capacity. The trade usually abbreviates this term to speak simply of tankers "deadweight." This specification reports total weight, usually in long tons, of fresh water, stores, bunkers, and cargo a vessel can carry. For oil tankers, cargo averages 95 to 96 percent of the total.							
<a href="http://www.poten.com/?URL=ut_glossary_pu.asp">http://www.poten.com/?URL=ut_glossary_pu.asp</a>							

**Appendix B**  
**Summary Tables for 2004 & 2008 Studies**

**Appendix B. 2004 Tables**

**Table 1. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA and PB Private Docks (VLCC Tanker): PCCA at 45 Feet, PHA and PB at 40 Feet**

	Port of Corpus Christi				Port of Houston				Port of Beaumont			
	PCCA Totals	Saudi Arabian	United Kingdom	Venezuela	PHA Totals	Saudi Arabian	United Kingdom	Venezuela	PB Totals	Saudi Arabian	United Kingdom	Venezuela
Crude Oil Imports (2002 th short tons)	28,543				45,580				54,956			
Crude Oil Imports (2002 th bbls)	209,220				334,101				402,827			
F.O.B. Costs (Origin) 2002 Av.		23.92	24.50	20.13		23.92	24.50	20.13		23.92	24.50	20.13
Landed Costs at the Point of Discharge (2002 av.) <sup>a,b</sup>												
Charter Tanker Cost from Origin		0.8062	0.4111	0.1514		0.8062	0.4111	0.1514		0.8062	0.4111	0.1514
Tariff (Wharfage & Handling Charges)		0.0200	0.0200	0.0200		-	-	-		-	-	-
Lightering (incl piloting & tug costs)		0.4743	0.4743	0.4743		0.5325	0.5325	0.5325		0.6299	0.6299	0.6299
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007				
<b>Total Port Charges</b>		0.494	0.494	0.494		0.5391	0.5391	0.5391		0.630	0.630	0.630
Calculated Refiners Acquisition Costs		25.221	25.405	20.776		25.265	25.450	20.821		25.356	25.541	20.911
Port Charges (incl lightering) as Percent of Refiners Cost		1.960%	1.946%	2.379%		2.134%	2.118%	2.589%		2.484%	2.466%	3.012%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential. Lightering prices include the cost of tug, piloting and other port costs.

**Table 2. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA and PB Private Docks (Suezmax Tanker): PCCA at 45 Feet, PHA and PB at 40 Feet**

	Port of Corpus Christi				Port of Houston				Port of Beaumont			
	PCCA Totals	Saudi Arabian	United Kingdom	Venezuela	PHA Totals	Saudi Arabian	United Kingdom	Venezuela	PB Totals	Saudi Arabian	United Kingdom	Venezuela
Crude Oil Imports (2002 th short tons)	28,543				45,580				54,956			
Crude Oil Imports (2002 th bbls)	209,220				334,101				402,827			
F.O.B. Costs (Origin) 2002 Av.		23.92	24.50	20.13		23.92	24.50	20.13		23.92	24.50	20.13
Landed Costs at the Point of Discharge (2002 av.) <sup>a,b</sup>												
Charter Tanker Cost from Origin		15.9200	6.6667	2.3880		15.9200	6.6667	2.3880		15.9200	6.6667	2.3880
Tariff (Wharfage & Handling Charges)		0.0200	0.0200	0.0200		-	-	-		-	-	-
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007				
<b>Total Port Charges</b>		0.263	0.263	0.263		0.2855	0.2855	0.2855		0.337	0.337	0.337
Calculated Refiners Acquisition Costs		40.103	31.430	22.781		40.126	31.452	22.804		40.177	31.504	22.855
Port Charges (incl lightering) as Percent of Refiners Cost		0.656%	0.837%	1.155%		0.712%	0.908%	1.252%		0.840%	1.071%	1.476%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential. Lightering prices include the cost of tug, piloting and other port costs.

Appendix B. 2004 Tables (Conti)

**Table 3. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA and PB Private Docks (VLCC Tanker): PCCA & PHA at 45 Feet, PB at 40 Feet**

	Port of Corpus Christi				Port of Houston				Port of Beaumont			
	PCCA Totals	Saudi Arabian	United Kingdom	Venezuela	PHA Totals	Saudi Arabian	United Kingdom	Venezuela	PB Totals	Saudi Arabian	United Kingdom	Venezuela
Crude Oil Imports (2002 th short tons)	28,543				45,580				54,956			
Crude Oil Imports (2002 th bbls)	209,220				334,101				402,827			
F.O.B. Costs (Origin) 2002 Av.		23.92	24.50	20.13		23.92	24.50	20.13		23.92	24.50	20.13
Landed Costs at the Point of Discharge (2002 av.)a,b												
Charter Tanker Cost from Origin		0.8062	0.4111	0.1514		0.8062	0.4111	0.1514		0.8062	0.4111	0.1514
Tariff (Wharfage & Handling Charges)		0.0200	0.0200	0.0200		-	-	-		-	-	-
Lightering (incl piloting & tug costs)		0.4743	0.4743	0.4743		0.3555	0.3555	0.3555		0.6432	0.6432	0.6432
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007				
<b>Total Port Charges</b>		0.494	0.494	0.494		0.3621	0.3621	0.3621		0.6432	0.6432	0.6432
Calculated Refiners Acquisition Costs		25.221	25.405	20.776		25.088	25.273	20.644		25.369	25.554	20.925
Port Charges (incl lightering) as Percent of Refiners Cost		1.960%	1.946%	2.379%		1.443%	1.433%	1.754%		2.535%	2.517%	3.074%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.  
Lightering prices include the cost of tug, piloting and other port costs.

**Table 4. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA and PB Private Docks ( Suezmax Tanker): PCCA & PHA at 45 Feet, PB at 40 Feet**

	Port of Corpus Christi				Port of Houston				Port of Beaumont			
	PCCA Totals	Saudi Arabian	United Kingdom	Venezuela	PHA Totals	Saudi Arabian	United Kingdom	Venezuela	PB Totals	Saudi Arabian	United Kingdom	Venezuela
Crude Oil Imports (2002 th short tons)	28,543				45,580				54,956			
Crude Oil Imports (2002 th bbls)	209,220				334,101				402,827			
F.O.B. Costs (Origin) 2002 Av.		23.92	24.50	20.13		23.92	24.50	20.13		23.92	24.50	20.13
Landed Costs at the Point of Discharge (2002 av.)a,b												
Charter Tanker Cost from Origin		1.2357	0.6302	0.2321		1.2357	0.6302	0.2321		1.2357	0.6302	0.2321
Tariff (Wharfage & Handling Charges)		0.0200	0.0200	0.0200		-	-	-		-	-	-
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007				
<b>Total Port Charges</b>		0.263	0.263	0.263		0.1999	0.1999	0.1999		0.345	0.345	0.345
Calculated Refiners Acquisition Costs		25.419	25.393	20.625		25.356	25.330	20.562		25.501	25.475	20.707
Port Charges (incl lightering) as Percent of Refiners Cost		1.035%	1.036%	1.276%		0.789%	0.789%	0.972%		1.354%	1.356%	1.668%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.  
Lightering prices include the cost of tug, piloting and other port costs.

## Appendix B. 2008 Tables

**Table 1. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks (VLCC Tanker): PCCA & PHA at 45, PB & TC at 40 Feet with Pipeline to HSC**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**		
	PCCA Totals	Persian Gulf	United Kingdom	West Africa	PHA Totals	Persian Gulf	United Kingdom	West Africa	PB Totals	Persian Gulf	United Kingdom	West Africa	Tx City Totals**	Persian Gulf	United Kingdom
Crude Oil Imports (2007 th short tons)	27,539				50,589				45,224				21,900		
F.O.B. Costs (Origin) Mar 28, 2008		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99
Charter Tanker Cost from Origin		1.328	0.677	0.961		1.328	0.677	0.961		1.328	0.677	0.961		1.328	0.677
Tariff (Wharfage & Handling Charges)		0.045	0.045	0.045		-	-	-		-	-	-		0.0606	0.0606
Lightering (incl piloting & tug costs)		0.496	0.496	0.496		0.628	0.628	0.628		0.712	0.712	0.712		0.376	0.376
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007						0.003	0.003
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.540	0.540	0.540		0.635	0.635	0.635		0.712	0.712	0.712		0.557	0.557
Calculated Refiners Acquisition Costs		101.318	105.21	106.73		101.41	105.30	106.83		101.49	105.38	106.90		101.33	105.22
Port Charges (incl lightering) as Percent of Refiners Cost		0.533%	0.514%	0.506%		0.626%	0.603%	0.594%		0.702%	0.676%	0.666%		0.549%	0.529%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.

Lightering prices include the cost of tug, piloting and other port costs.

\*Persian Gulf is OPEC average; UK is Brent Blend and West Africa is Nigerian Tio Juana Light

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of Wharfage rate is that for unleased docks.

**Table 2. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks ( Suezmax Tanker): PCCA & PHA at 45, PB & TC at 40 Feet with Pipeline to HSC**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**		
	PCCA Totals	Persian Gulf	United Kingdom	West Africa	PHA Totals	Persian Gulf	United Kingdom	West Africa	PB Totals	Persian Gulf	United Kingdom	West Africa	Tx City Totals**	Persian Gulf	United Kingdom
Crude Oil Imports (2007 th short tons)	27,539				50,589				45,224				21,900		
F.O.B. Costs (Origin) Mar 28, 2008		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99
Charter Tanker Cost from Origin		2.64	1.34	1.91		2.64	1.34	1.91		2.64	1.34	1.91		2.64	1.34
Tariff (Wharfage & Handling Charges)		0.045	0.045	0.045		-	-	-		-	-	-		0.061	0.061
Lightering (incl piloting & tug costs)		0.250	0.250	0.250		0.324	0.324	0.324		0.381	0.381	0.381		0.179	0.179
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007						0.003	0.003
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.295	0.295	0.295		0.331	0.331	0.331		0.381	0.381	0.381		0.360	0.360
Calculated Refiners Acquisition Costs		102.38	105.63	107.43		102.42	105.67	107.47		102.47	105.72	107.52		102.45	105.69
Reported Refiners Acquisition Cost of Imported Crude (2002)															
Port Charges (incl lightering) as Percent of Refiners Cost		0.288%	0.280%	0.275%		0.323%	0.313%	0.308%		0.372%	0.361%	0.355%		0.351%	0.340%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on milage differential.

Lightering prices include the cost of tug, piloting and other port costs.

\*Persian Gulf is OPEC average; UK is Brent Blend and West Africa is Nigerian Tio Juana Light

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of Wharfage rate is that for unleased docks.

## Appendix B. 2008 Tables (Conti)

**Table 3. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks (VLCC Tanker): PCCA at 52, PHA at 45 & PB & TC at 40 Feet with Pipeline to HSC**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**		
	PCCA Totals	Persian Gulf	United Kingdom	West Africa	PHA Totals	Persian Gulf	United Kingdom	West Africa	PB Totals	Persian Gulf	United Kingdom	West Africa	Tx City Totals**	Persian Gulf	United Kingdom
Crude Oil Imports (2007 th short tons)	27,539				50,589				45,224				21,900		
F.O.B. Costs (Origin) Mar 28, 2008		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99
Charter Tanker Cost from Origin		1.328	0.677	0.961		1.328	0.677	0.961		1.328	0.677	0.961		1.33	0.68
Tariff (Wharfage & Handling Charges)		0.045	0.045	0.045		-	-	-		-	-	-		0.0606	0.0606
Lightering (incl piloting & tug costs)		0.295	0.295	0.295		0.628	0.628	0.628		0.712	0.712	0.712		0.376	0.376
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007						0.003	0.003
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.34	0.34	0.34		0.63	0.63	0.63		0.71	0.71	0.71		0.56	0.56
Calculated Refiners Acquisition Costs		101.12	105.01	106.53		101.41	105.30	106.83		101.49	105.38	106.90		101.33	105.22
Port Charges (incl lightering) as Percent of Refiners Cost		0.336%	0.324%	0.319%		0.626%	0.603%	0.594%		0.702%	0.676%	0.666%		0.549%	0.529%

a Includes the price to acquire the crude, plus the cost of transportation from the point of acquisition up to the point of discharge,

including insurance, transshipping fees, and lightering fees. Does not include charges incurred at the discharge port, e.g., import tariffs, wharfage charges and demurrage charges.

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on mileage differential.

Lightering prices include the cost of tug, piloting and other port costs.

\*Persian Gulf is OPEC average; UK is Brent Blend and West Africa is Nigerian Tio Juana Light

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of Wharfage rate is that for unleased docks.

**Table 4. Landed Costs of Foreign Crude Oil: PCCA Compared with PHA, PB & TC Private Docks (Suezmax Tanker): PCCA at 52 Feet; PHA at 45 & PB & TC at 40 Feet with Pipeline to HSC**

	Port of Corpus Christi				Port of Houston				Port of Beaumont				Port of Texas City**		
	PCCA Totals	Persian Gulf	United Kingdom	West Africa	PHA Totals	Persian Gulf	United Kingdom	West Africa	PB Totals	Persian Gulf	United Kingdom	West Africa	Tx City Totals**	Persian Gulf	United Kingdom
Crude Oil Imports (2007 th short tons)	27,539				50,589				45,224				21,900		
F.O.B. Costs (Origin) Mar 28, 2008		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99	105.23		99.45	103.99
Charter Tanker Cost from Origin		2.636	1.344	1.907		2.636	1.344	1.907		2.636	1.344	1.907		2.636	1.344
Tariff (Wharfage & Handling Charges)		0.045	0.045	0.045		-	-	-		-	-	-		0.0606	0.0606
Lightering (incl piloting & tug costs)		0.067	0.067	0.067		0.324	0.324	0.324		0.381	0.381	0.381		0.179	0.179
Port Property Taxes on the Refiner		-	-	-		0.007	0.007	0.007						0.003	0.003
<b>Total Lightering plus Port Charges (av Bbl for the load)</b>		0.112	0.112	0.112		0.331	0.331	0.331		0.381	0.381	0.381		0.360	0.360
Calculated Refiners Acquisition Costs		102.20	105.45	107.25		102.42	105.67	107.47		102.47	105.72	107.52		102.45	105.69
Port Charges (incl lightering) as Percent of Refiners Cost		0.110%	0.106%	0.105%		0.323%	0.313%	0.308%		0.372%	0.361%	0.355%		0.351%	0.340%

Note: Landed cost for U.S. average is used to estimate landed cost to individual ports by adjusting transportation cost based on mileage differential.

Lightering prices include the cost of tug, piloting and other port costs.

\*Persian Gulf is OPEC average; UK is Brent Blend and West Africa is Nigerian Tio Juana Light

\*\* Approximately 45% (180,000/Bbl/day out of 400,000/Bbl/day) is pipelined to the ExxonMobile/Baytown and Houston-Lyondell refineries. This table is based on a weighted average of Wharfage rate is that for unleased docks.

Appendix B. 2008 Tables (Conti)

**Table 5. Summary of Landed Cost Differences Between Corpus Christi, Houston, Beaumont and**

	Corpus Christi & Houston		Corpus Christi & Beaumont		Corpus Christi & Texas City	
	VLCC	Suezmax	VLCC	Suezmax	VLCC	Suezmax
Case I. Houston Deepened Channel Depths to Beltway 8: Current Average Lightering Costs (Corpus 45', Houston 45' Beaumont 40' & Tx City 40')	-\$0.094	-\$0.036	-\$0.172	-\$0.086	-\$0.016	-\$0.064
Case II. Houston Deepened Channel Depths to Beltway 8: Weighted Average Where Shell, ITC & VOPAK do not Upgrade Docks & Including Pipeline Deleveries from Texas City (Corpus 45', Houston 40' - 45' & Beaumont 40' & Tx City 40')	-\$0.193	-\$0.104	-\$0.172	-\$0.086	-\$0.016	-\$0.064
Case III. Planned Corpus Christi Channel Depths (Corpus 52', Houston 45' & Beaumont 40' & Tx City 40')	-\$0.295	-\$0.219	-\$0.372	-\$0.269	-\$0.217	-\$0.247

**APPENDIX C. NAVIGATION SAFETY GUIDELINES ON THE HOUSTON SHIP  
CHANNEL BETWEEN GALVESTON BAR AND THE TURNING BASIN**

BOLIVAR ROADS TO BARBOUR'S CUT

Maximum Vessel Size 950' LOA: 135' BEAM

BARBOUR'S CUT TO BAYTOWN

Maximum Vessel Size - 900' LOA: 135' BEAM

BAYTOWN TO BOGGY BAYOU (SHELL)

Maximum Vessel Size - 860' LOA: 120' BEAM

**Vessels exceeding 800' LOA or 39' Draft will be restricted to DAYLIGHT  
PASSAGE only above Baytown.**

\* Permitted draft may be less than 39' because of conditions of the Channel or Tide.

BOGGY BAYOU TO SIMS BAYOU (ARCO)

Maximum Vessel Size - 750' LOA: 116' BEAM

Vessels exceeding 105' Beam, but not exceeding 116', shall not be allowed to meet any  
ship traffic above Boggy Bayou.

SIMS BAYOU TO HOUSTON TURNING BASIN

Maximum Vessel Size - 750' LOA: 106' BEAM

**Vessels exceeding 700' LOA or 37' draft will be restricted to DAYLIGHT  
PASSAGE only between Sims Bayou and the Houston Turning Basin.**

\* Permitted draft may be less than 37' because of conditions of the Channel or Tide.

Draft formula for vessels going to docks from SP Slip to City 26 will be 36' plus or minus  
tide, not to exceed 37', as measured by the closest tide gauge. Vessels with draft over 36'  
will take two pilots above the SP Slip. Rule will be void if project depth for this area is  
changed.

ENTIRE LENGTH OF HOUSTON SHIP CHANNEL

**DRAFT SAFETY GUIDE LINES** - The maximum draft based on the Tide Gauge at  
Morgan's Point (fresh water), at 0 = 40 ft., 1 ft. below 0 = 39 ft., etc. (1/15/01)

Dead ships will be restricted to handling/shifting during DAYLIGHT hours only.

LNG and LPG Tank Ships exceeding 550' LOA will be restricted to DAYLIGHT transit  
only.

Tug assistance requirements shall be determined mutually by the Master and Pilot for  
each individual vessel during a particular transit. No predetermined requirements for tug  
assistance applicable to all vessels of similar size, configuration and/or draft shall be  
prescribed.

NOTE: The above limitations are based on normal traffic and weather conditions.

Variations from the above safety guidelines may be imposed at times by Federal, State or  
local authorities because of weather, prevailing channel conditions, or other reasons.

The foregoing safety guidelines may be exceeded only if prior arrangements are made  
between the vessel owner and/or agent and the Pilot.

\*Vessels exceeding guidelines listed above may be subject to various restrictions  
including additional pilots, daylight only passage, or may be denied entry.