4.0 Supply and Storage of Petroleum Products

4.1 Product Supply Chains

The existing pricing zones established throughout the province are presented in Appendix A together with geographic descriptions for each. As they now exist, Pricing Zones are the same for automotive fuels and home heating fuels.

In order to judge the appropriateness of existing zonal boundaries and price differentials, all identified costs involved in getting product to the point of sale for the end consumer in each zone or sub-zonal area had to be calculated with as much accuracy as possible.

To identify all cost elements, product flow or Supply Chain Configuration Diagrams were developed for each product group. Figures 1 and 2 on the following page depict basic supply chain configuration diagrams for retail automotive fuels and home heating fuels respectively. These diagrams show the primary methods of product supply and distribution for each of these product groups.

The main difference between the two diagrams is that the majority of automotive fuel volume is delivered directly from marine terminals via tractor trailer to retail outlets, whereas home heating fuels are delivered to consumers' household storage tanks via tank wagon vehicles, which operate direct from marine terminals or from local areas bulk plants.

Because many variations of these supply and delivery modes are used in the province depending on the product and the particular zone in question, Supply Chain Diagrams for each individual zone and sub-zone and for each product group are included in this Study.

In some cases, complicating factors affect cost determinations because different petroleum marketers sometimes use different methods of product supply to the same area. The Consulting Team had to be cognizant of these differences and decide on the inclusion of a chosen supply chain consistent with that of primary suppliers to certain areas without giving preference to any particular supplier.

In all but a few instances, the supply chain chosen was that identified to be the one on which the majority of consumers depend as the primary method of product supply to their particular areas.

It should be noted that cost calculations in this Study do not reflect, nor include, the inventory carrying costs for product held in marine terminals, bulk plants, storage depots, retail outlets, or tank trucks. The main reason for not attempting to include these costs is the wide and indeterminate variations in inventory levels that exist in storage locations at any point in time. This is particularly significant for inventories in the large primary marine terminals. The difficulty in quantifying inventory costs does not allay the fact that they are real costs and therefore must be considered when looking at total margins available to supply chain participants.

FIGURE 1

BASIC SUPPLY CHAIN CONFIGURATION DIAGRAM

Retail Automotive Fuels

Newfoundland and Labrador

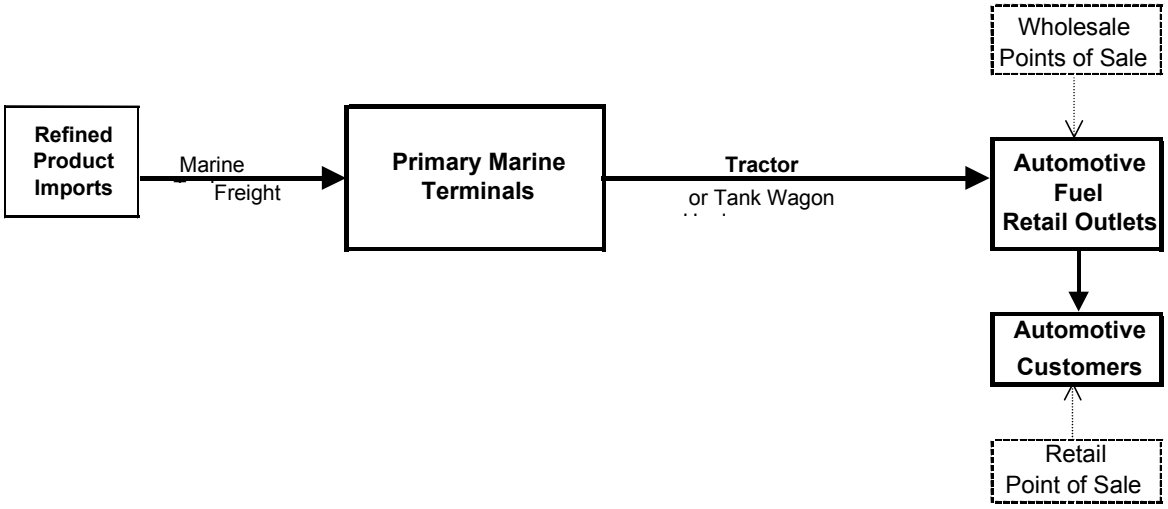
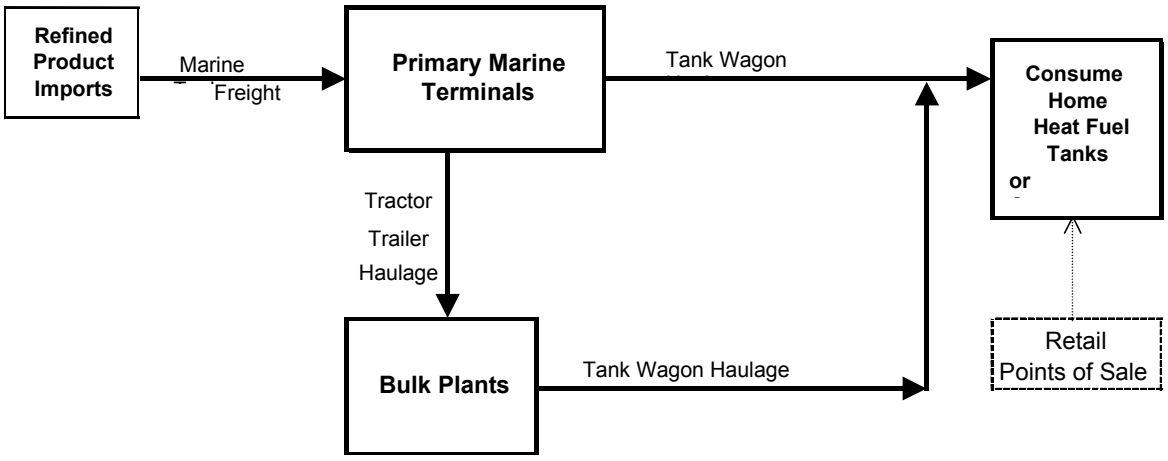


FIGURE 2

BASIC SUPPLY CHAIN CONFIGURATION DIAGRAM

Home Heating Fuels (Excluding Propane)

Newfoundland and Labrador



4.2 Costs of Shipping Products to Marine Terminals and Marine Depots

The costing models developed in this Study for specific modes of storage and transportation use a combination of proprietary costs supplied in confidence by some petroleum and transportation companies, together with cost estimates developed by the Consulting Team through data collection, its analysis and application.

The determination of marine freight costs to primary marine terminals was not to be part of this Study because they were already identified in a Marine Tanker Freight Cost Study undertaken by the Petroleum Products Pricing Commission in 2002. However, the Consulting Team had the advantage of additional information presumably not available to those who carried out the referenced Marine Tanker Freight Study. This resulted in some revisions to estimated average marine freight numbers to specific marine terminals.

A summary of the estimated average laid-in marine freight costs for currently operating Primary Marine Terminals, Secondary Marine Terminals and Marine Depots is presented in Table 1 below:

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Table 1

Estimated Average Laid-in Marine Freight Costs*Note 1

Existing PPPC Zone	Existing PPPC Sub-Zone	Area Serviced	Notes	Average Marine Freight Estimate CPL
1		Avalon Peninsula	Average Freight to St. John's / Holyrood Primary Marine Terminals	0.85
3		Central Newfoundland	Average Freight to Lewisporte Primary Marine Terminal	1.24
6		Corner Brook Area	Average Freight Corner Brook Primary Marine Terminals	1.19
9		Northern Peninsula North	Average Freight to St. Barbe Secondary Marine Terminal	2.19
10		Labrador-The Straits	Average Freight to Marine Depots	4.42
10	a	Labrador Coast - South	Average Freight to Marine Depots	6.64
12		Central Labrador	Average Freight to Goose Bay Primary Marine Terminals	1.80
14		Labrador Coast - North	Average Freight to Marine Depots	6.64

*Note 1: See next page for glossary of terms.

Some of the marine freight rates include calculated shipping costs via coastal tankers to secondary marine terminals and marine depots. These reflect 2004 estimated costs of product deliveries to these specific locations from identified source terminals. Some of this data is proprietary and was provided under Confidentiality and Non-Disclosure Agreements with the Consultant Team. Detailed calculations are therefore not included in this report.

A glossary of terms used in Table 1 follows:

Laid-in Cost

The landed cost of product pumped into receiving storage tanks.

Primary Marine Terminals

Large storage terminals supplied with refined products via marine tanker from Canadian refineries or from offshore sources. These terminals have the capacity to supply large geographic areas either by direct delivery or by trans-shipment through local bulk plants. The North Atlantic Petroleum refinery at Come by Chance is considered to be a primary marine terminal for the purposes of this Study.

Secondary Marine Terminals

Smaller marine terminals having sufficient storage capacity to supply a particular area where supply from primary terminals is, or has in the past, been impractical. These terminals are generally supplied with product by trans-shipment via coastal tankers from primary terminals, but sometimes receive product direct from other sources.

Marine Depots

These facilities are small capacity storage plants generally supplied by coastal tankers from the larger marine terminals. These depots are usually associated with isolated communities such as those that exist along the Labrador Coast. Due to the short shipping season, particularly in northern Labrador, the capacity of many of these depots is often sufficient to hold enough product inventory for an entire year.

Bulk Plants

These are intermediate 'drop-off' storage facilities supplied by tractor-trailers from marine terminals by road. They are often essential to properly service home heat consumers in a local geographic area but in some cases also contain gasoline storage necessary to service small local area retail outlets where product delivery by tractor-trailer direct from marine terminals is not practical.

4.3 Operating Costs of Marine Terminals, Marine Depots and Bulk Plants

The next link in the product supply chain is the operation of storage terminals. Some of the costs for the operation of primary and secondary marine terminals were obtained under Confidentiality and Non-Disclosure Agreements. Using these figures, normalized with other available and developed costing information, the Consulting Team was able to calculate costs on a cents per litre basis for the operation of these storage facilities including allowances for depreciation and stock losses. These estimates are presented in Table 2 below:

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Table 2

Estimated Average Operating Costs - Marine Terminals

Area Serviced	Terminal Identification and Location	Operating Cost Estimates 2004 CPL
Avalon / Burin / Bonavista-Peninsulas -and Central Newfoundland	St. John's / Holyrood Primary Marine Terminals	0.81
Central Newfoundland	Lewisporte Primary Marine Terminal	1.57
Corner Brook Area	Corner Brook Primary Marine Terminals	1.22
Northern Peninsula North	St. Barbe Secondary Marine Terminal	1.76
Central Labrador	Goose Bay Primary Marine Terminals	2.71

Accurate total annual operating costs for terminals were not available in a form that could be used on a consistent basis in comparing one terminal with another so they are not included in this report.

Marine depots are identified in Table 1 in zones along the coast of Labrador. However, very little reliable information was available with respect to their costs of operation. Whereas these depots receive product via smaller marine tankers, they are not otherwise greatly different in configuration from that of many bulk plants in operation around the province. Thus, one approach in developing a costing model for marine depots was to extrapolate costs based on the cost of operating bulk plants. First, however, it was necessary to develop a model with associated capital replacement costs estimated for environmentally sound and insurable bulk plants. Once the capital costs were established, operating costs could then be addressed.

Capital Replacement costs of Bulk Plants and Marine Depots

The approach used in this process was to categorize bulk plants and marine storage depots in the following classifications:

Case A. Bulk Plant - Intermediate tractor-trailer drop-off storage for subsequent delivery of furnace oil to local area home heat customers. (Construction on Island portion of province) Tank capacities are sized according to product turnover so that no more than four tractor-trailer deliveries per week were required during the peak demand winter months leaving a buffer of at least one working day per week spare capacity.

Case B: Bulk Plant - Intermediate tractor-trailer drop-off storage for subsequent delivery of furnace oil to local area home heat customers and gasoline storage for local distribution. Gasoline is held for deliveries to small local retail outlets where delivery via tractor-trailer is impractical. Operating costs for these particular bulk plants on the island portion of the province were obtained via proprietary information from owner/ operators with adjustments applied for consistency following information gathered during field visitations.

Case C. Bulk Plants on the Labrador Coast - Bulk storage facilities along the Labrador Coast supplied via tank wagon from connected marine depots. Storage for both gasoline and stove oil is assumed. Gasoline can be redelivered to small retail outlets in the local area or can be dispensed directly at the bulk plant. Stove oil (the only petroleum product used throughout Labrador for home heating) is stored for subsequent delivery to local area home heat customers by tank-wagon. Stove oil used for diesel fuel is also available.

Case D. Marine Depots - Bulk Storage facilities along the South Labrador Coast supplied via Coastal Tanker- sometimes via floating hose discharge. These storage depots are connected by road to adjacent communities. As with Case C bulk plants, gasoline and diesel fuel is provided for local deliveries to retail outlets via tank-wagon or in some cases dispensed directly to retail customers at the depot. Stove oil is stored for subsequent delivery to local area home heat customers via tank-wagon.

Case E. Marine Depots (Isolated) - Bulk Storage facilities located in isolated Labrador Coastal communities and supplied via coastal tanker - often via floating hose discharge. Stove oil/ diesel fuel distillate storage is available for subsequent delivery, or for pickup at the depots by customers via drums or other containers. These depots also have storage for gasoline, which is generally dispensed directly to retail customers via an onsite retail pump.

Appendix B includes capital cost estimates for each of the above storage facilities as follows:

Table B -1 Cost estimate versus volume for Class A Bulk Plants
Table B -2 Cost estimate for Class B Bulk Plant (nominal storage only)
Table B- 3 Cost estimate for a specific Class C Bulk Plant in Charlottetown, Labrador
Table B- 4 Cost estimate for a specific Class D Marine Depot in the Port Hope Simpson / Cartwright area of Labrador.
Table B -5 Cost estimate for a specific Class E Marine Depot in Rigolet
Table B -6 Cost estimate for a specific Class E Marine Depot in Makkovik
Table B -7 Cost estimate for a specific Class E Marine Depot in Postville
Table B -8 Cost estimate for a specific Class E Marine Depot in Hopedale
Table B -9 Cost estimate for a specific Class E Marine Depot in Nain

The capital cost estimates for these storage facilities take into account only the product volumes estimated for individual consumer use. No provision is made for automotive or heating fuels for commercial customers, nor for other fuels such as Jet Fuel or Diesel used for non-regulated product consumption. These volumes were unavailable to the Consulting Team and no estimates of their quantities were made.

Due to specific storage requirements for bulk plants and marine depots along the Labrador coast, each facility was addressed separately. Estimated seasonal demand in a particular section or area of the coast dictated how much storage capacity was required in each case.

Since the north coast of Labrador is inaccessible due to local ice or arctic ice flows for eight to nine months of the year (November to June), the storage capacity for these communities was sized to accommodate a full year's demand to provide a buffer in case of extended access problems or unusually high demand during the closed shipping season.

The south Labrador coast generally has a larger window of accessibility by marine tanker so depots were sized to hold less than the estimated demand for a full year, but sufficient to satisfy demand for about ten months. The bulk plant in Charlottetown was sized to store more than sufficient product for the winter months when the road to a larger feeder depot in the Labrador Straits area could be blocked by snowdrifts or otherwise become impassable.

In these capital cost estimates, provision for higher transportation and construction costs is made for bulk plants and depots along the Labrador Coast. Approximately 20% is added to certain costs for road-connected plants and some costs are increased up to 50% for construction in isolated communities.

It could be argued that this approach to estimating a capital replacement cost for these bulk storage facilities is not realistic in view the fact that the existing plants have been in place in the subject locations for a number of years. It is felt, however, that this is a necessary approach given the possibility that an existing supplier could withdraw or that a competitor may wish to enter the market place.

Operating Costs for Bulk Plants and Marine Depots

Case A - Bulk Plants with Home Heating Fuels only:

Proprietary information obtained from companies operating 'home heat distillates only' bulk plants was sporadic and inconsistent making general comparisons difficult and cost standardization impossible. It was therefore decided to construct a costing model for home heat bulk plants based on storage volume - versus thruput - versus operating costs. Given estimated sales volumes, one could then project the capital and operating cost of a bulk plant on the Island of Newfoundland with some consistency. Capital cost estimates for Case A Bulk Plants having three thruput ranges are presented in Appendix B, Table B-1. Operating cost estimates versus volume could therefore be calculated and are presented in Appendix B, Table B-10.

Case B - Bulk Plants with Home Heating Fuels and Gasoline:

The nominal capital replacement cost for a combination Case B Bulk Plant for local storage of home heat fuels, gasoline and diesel fuel is given in Table B-2 of Appendix B. In the case of the four identified combination bulk plants currently in use, proprietary operating costs were obtained and by normalizing stock losses and some other expense items, the final cents per litre thruput costs for gasoline and diesel fuel through these plants are estimated as follows:

Gander Bulk Plant	-	Automotive Fuels	-	0.67 cpl
Fogo Island Bulk Plant	-	Automotive Fuels	-	1.51 cpl
Pool's Cove Bulk Pant	-	Automotive Fuels	-	1.03 cpl
Springdale Bulk Plant	-	Automotive Fuels	-	0.71 cpl

Case C Bulk Plants on the South Labrador Coast:

To date, this specifically includes a single bulk storage plant at Charlottetown, which is normally filled via tank-wagon from the marine depot in L'Anse au Loup.

Case D Marine Depots on the South Labrador Coast - connected by road to communities from L'Anse au Clair to Cartwright:

These currently include the storage depots at L'Anse au Clair, L'Anse au Loup, Port Hope Simpson, Cartwright and possibly others. The Port Hope Simpson Marine Depot is reportedly being upgraded to become the central distribution depot for the section of the south Labrador Coast from Lodge Bay to Cartwright for one supplier. The average operating cost for the marine depots at L'Anse au Clair and L'Anse au Loup is estimated at 2.45 cpl.

The estimated annual operating costs for the plants identified in Case C (Charlottetown) and Case D (Port Hope Simpson) are calculated in Table B-11. Average costs for gasoline and distillate fuels are shown separately to accommodate a relatively higher stock loss provision for gasolines, which is traditionally experienced in these plants in Labrador. These stock losses are partly due to wide day/ night temperature variances, but are otherwise unexplained shortages.

Case E Isolated Marine Depots along the Labrador Coast:

Separate operating cost estimates are given for each of five North Labrador Coast communities based on capital costs and annual volumes. These are shown in Appendix B, Tables B-12 through B-14. Table B-15 summarizes and averages the costs of operating these depots separately for gasoline and distillates (stove oil and diesel fuel).

The Innu community of Natuashish is not directly considered in these analyses and was not visited during the Consulting Team field trips. It is understood that the Innu Band Council is responsible for operating the fuel depot in that community and no details on supply or other costs were acquired. It is, however, expected that the costs of supplying fuels at Natuashish would be similar to that for the five other communities on the North Labrador Coast.

Black Tickle, an isolated island community located on the South Coast of Labrador, also has a Marine Storage Depot. The cost of fuel supply to that location is also considered to be the same as the average costs calculated for the five North Coast communities.

<u>Thruput costs for Automotive Fuels through Bulk Plants and Marine Depots</u>

Table 3 below summarizes the average estimated costs for the thruput of gasolines and diesel fuel through bulk plants and marine depots around the province. The costs for both products are considered to be the same for plants on the island portion of the province and for the Straits section of Labrador. For the rest of the Labrador Coast with generally smaller facilities, stock loss allowances for gasolines and distillates are higher, as is the difference between them. Therefore, where indicated in the Tables in Appendix B as well as in Table 3, plant-operating costs for each of these products are shown separately.

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Table 3

Automotive Fuels

Estimated Operating Costs for Bulk Plants / Marine Depots

Area Serviced	Type of Facility	Location of Storage Facility	Approximate Average Annual Thruput Kilolitres	**Estimated Average Operating Cost CPL**
Central Newfoundland	Bulk Plant	Gander	10,000	**0.67**
Fogo Island	Bulk Plant	Fogo Island	1,500+	**1.51**
Connaigre Peninsula	Bulk Plant	Pool's Cove Crossroads	3,200+	**1.03**
Triton/ Springdale/ Baie Verte	Bulk Plant	Springdale	3,000+	**0.71**
Labrador Straits	Marine Depots	L'Anse au Clair / L'Anse au Loup	5,000	**2.45**
Labrador South – Lodge Bay to Cartwright	Bulk Plant / Marine Depot	Port Hope Simpson/ Charlottetown / Other (Gasoline)	2,000	**7.77**
Labrador South – Lodge Bay to Cartwright	Bulk Plant / Marine Depots	Port Hope Simpson/ Charlottetown / Other (Diesel)	N/A	**7.39**
Labrador South - Black Tickle	Marine Depot	Black Tickle – Isolated Community (Gasoline)	270	**15.59**
Labrador South - Black Tickle	Marine Depot	Black Tickle – Isolated Community (Diesel)	N/A	**14.09**
Western Labrador	Bulk Plant	Labrador City	N/A	N/A
Northern Labrador Coastal Communities	Marine Depots	Isolated Communities (Gasoline)	263	**15.59**
Northern Labrador Coastal Communities	Marine Depots	Isolated Communities (Diesel)	N/A	**14.09**

Thruput costs for Heating Fuels through Bulk Plants and Marine Depots

Table 4 below summarizes the estimated costs for thruputting home heating fuels (furnace and stove oil) through bulk plants and marine depots around the province. Costs in cents per litre have been calculated using the costing model as previously explained and shown in detail in the Tables of Appendix B. In the majority of cases, the calculations have been made for bulk plants that already exist in the locations indicated. The sole exception is for Bell Island where a small bulk plant is included in the list because one has reportedly been proposed by at least one company in order to properly service the Island's home heat customers.

The operating or thruput costs for bulk plants in some adjacent areas are sufficiently close numerically that they have been combined and averaged as shown in the Table.

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Table 4

Home Heating Fuels

Estimated Thruput Costs for Bulk Plants / Marine Depots

Area Serviced	Location of Bulk Plant / Marine Depot	Estimated Home Heat Fuel Volume for Area Kls	Estimated Number Heating Fuel Storage Plants in Area	Estimated Average Operating Cost per Plant CPL	Combined Area Average Operating Cost per Plant CPL
North West Avalon	Bay Roberts/ Harbour Grace/Carbonear	22,000	4	1.19	**1.19**
South West Avalon	Placentia / Dunville Area	6,500	2	1.47	**1.46**
South East Avalon	Aquaforte / Trepassey/ St. Mary's	6,600	2	1.46	
Bell Island	*Bell Island*	*2,500*	*1*	*1.86*	***1.86***
Burin Peninsula	Marystown / Grand Bank / Burin	14,900	3 to 4	1.30	
Clarenville Area	Clarenville / Musgravetown/ Lethbridge	7,500	2	1.40	**1.36**
Bonavista Peninsula	Catalina / Trinity/ Bonavista Area	9,500	2 to 3	1.40	
Central Newfoundland	Gander / Lewisporte/ Grand Falls	42,000	4 to 5	0.84	**0.84**
Fogo Island	Fogo Island	2,000	1	1.23	**1.23**
Connaigre Peninsula	Milltown/ Pool's Cove / Harbour Breton	5,000	1	1.17	**1.17**
Triton/ Springdale/ Baie Verte Peninsula	South Brook/ Springdale/ Baie Verte	10,000	2	1.17	**1.17**
Deer Lake / Corner Brook/ Humber Arm	Deer Lake/ Pasadena / Corner Brook	21,000	1	1.37	**1.37**
Stephenville/ Port au Port Peninsula	Stephenville/ Stephenville Crossing	12,000	3	1.30	**1.34**
Port aux Basques Area	Port aux Basques	3,700	1	1.41	
Burgeo	Burgeo/ Ramea/ Coastal Communities	1,900	1	2.35	**2.35**
Northern Peninsula North	Port au Choix/ Plum Point/ Roddickton	8,800	2	1.40	**1.40**
Labrador Straits	L'Anse au Clair/ L'Anse au Loup	1,200	2	2.45	**2.45**
Labrador South – Lodge Bay to Cartwright	Port Hope Simpson/ Charlottetown	450	2	7.39	**7.39**
Western Labrador	Labrador City / Wabush	N/A	1	N/A	N/A
Northern & Isolated Labrador Coastal Communities	Various - Each Isolated Community	980	5	14.09	**14.09**

Table 5 on the following page combines all marine freight and storage terminal / depot operating cost estimates as indicated in this section of the report into a single table, which has been expanded to include all existing zones as designated by the PPPC in Appendix A. Some of the cost numbers have been reallocated to more realistically reflect the method by which much of the product is supplied to certain areas. For instance, the cost of product to secondary terminals has been dropped in favour of using the cost through primary terminals and subsequent direct trucking. Also, due to supply logistics, some major suppliers truck

product from marine terminals on the Avalon Peninsula to bulk plants and / or directly to retail outlets in central Newfoundland. The figures in Table 5 will be used as cost inputs for zone differential calculations later in this report.

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Table 5

Summary – Automotive and Home Heat Fuels

Estimated Average Marine Freight and Marine Terminal / Marine Depot - Operating Costs used for Calculations			Marine Freight to Terminals/ Depots 2004 (Table 1)	Estimated Terminal / Depot Operating Cost (Tables 2, 3, & 4)	Total Estimated Freight and Terminal Operating Cost
Zone		**Zone Description**	**CPL**	**CPL**	**CPL**
1		Avalon	0.85	0.81	1.66
1	a	Bell Island	0.85	0.81	1.66
2		Burin-Bonavista Peninsulas	0.85	0.81	1.66
3		Central Newfoundland – Avalon Terminals	0.85	0.81	1.66
3	a	St. Brendan's Island	0.85	0.81	1.66
3	b	Fogo Island	0.85	0.81	1.66
3	c	Change Islands	0.85	0.81	1.66
4		Connaigre Peninsula	0.85	0.81	1.66
4	a	Gaultois-Francois	0.85	0.81	1.66
5		Springdale-Baie Verte (Ex Corner Brook)	1.19	1.22	2.41
5	a	Long Island	1.19	1.22	2.41
5	b	Little Bay Islands	1.19	1.22	2.41
6		Corner Brook Area	1.19	1.22	2.41
7		Stephenville-Port aux Basque-Burgeo	1.19	1.22	2.41
7	a	Ramea	1.19	1.22	2.41
7	b	Grey River/La Poile	1.19	1.22	2.41
8		Northern Peninsula South	1.19	1.22	2.41
9		Northern Peninsula North	1.19	1.22	2.41
10		Labrador - The Straits (Averaged)	4.42	2.45	6.87
10	a	Mary's Harbour to Cartwright – Gasoline	6.64	7.77	14.41
10	a	Mary's Harbour to Cartwright – Stove Oil / Diesel	6.64	7.39	14.03
11		Isolated Communities with Marine Depots Labrador Coast- South – Gasoline	6.64	15.59	22.23
11		Isolated Communities with Marine Depots Labrador Coast- South – Stove Oil / Diesel	6.64	14.09	20.73
12		Central Labrador (Goose Bay)	1.80	2.71	4.51
13		Western Labrador – Gasoline & Diesel	N/A	N/A	6.50
13	a	Churchill Falls – Gasoline & Diesel	N/A	N/A	6.50
14		Labrador Coast – North – Gasoline	6.64	15.59	22.23
14		Labrador Coast – North - Stove Oil / Diesel	6.64	14.09	20.73