Expert Report of Arlie G. Sterling

June 9, 2017

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I.   Contents

I.   Introduction

1.   My name is Arlie G. Sterling. I have been retained by the Government of Canada (the "Respondent") in its dispute with Bilcon of Delaware, Inc. and various members of the Clayton family (the "Claimants") with regard to the proposed construction and operation of an aggregates quarry and marine loading terminal on Digby Neck, in the Province of Nova Scotia ("Whites Point" or "the project"), by Bilcon of Nova Scotia ("Bilcon").

2.   My specific assignment is to evaluate the projected shipping freight costs provided by the Claimants in this arbitration to transport aggregates from Whites Point to three locations in the United States ██ ████████████████████████████ during the project's proposed 50-year life. I've been instructed to conduct my analysis with respect to the freight rates from the vantage point of October 22, 2007, which I understand is the date of the measures that the Tribunal in this case identified as a breach of Canada's obligations under Chapter 11 of NAFTA.

3.   In conducting my analysis, I have reviewed reports filed by the Claimants in 2016 in this arbitration, including the Expert Report of Wayne Morrison, Tamarack Resources ("Tamarack Report")[1] and its accompanying model ("Tamarack Model")[2] and the Expert Report of Howard Rosen, FTI Consulting ("Rosen Report").[3] In addition, I have reviewed documents that were contemporaneous with the project's environmental assessment process, including the 2004 Bilcon business plan,[4] Bilcon's March 2006 Environmental Impact Statement ("EIS"), Bilcon's November 2006 Revised Project Description,[5] and other related documents.

4.   While the Claimants' assumptions and conclusions with regard to the freight costs are generally described in the Tamarack Report and the Rosen Report, the reports do not provide the necessary

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[1] Expert Report of Wayne Morrison, Tamarack Resources, December 9, 2016 ("Tamarack Report").

[2] **C-1108**, Tamarack Excel model, Freight Rate Calculation.

[3] Expert Report of Howard Rosen, FTI Consulting, December 15, 2016 ("Rosen Report").

[4] **R-717**, Business Plan for Whites Point Quarry, Prepared by Clayton Concrete, April 2004.

[5] **C-1**, Whites Point Quarry & Marine Terminal Environmental Impact Statement, March 31, 2006; **R-581**, Whites Point Quarry & Marine Terminal, Revised Project Description, November 2006 ("Revised Project Description").

documentation to fully evaluate their methodology or assumptions. I have attempted to replicate the Claimants' approach based on the available information and my independent research.

5.   My analysis shows that the Claimants significantly underestimate the shipping freight costs of the project. In the following sections of this report, I summarize the problems with the Tamarack Report and the Rosen Report, recommend corrections to the Tamarack Model inputs, and propose an alternative methodology ███████████████████████████████████████ that addresses the limitation of the Tamarack methodology. A comparison of shipping freight costs results following these different methodologies is presented at the end of this report. All costs in this report are denominated in US dollars.

II.   The Whites Point Quarry Project

6.   My understanding is that Bilcon proposed, in an EIS and other documents submitted to the regulatory authorities in Canada in 2004 and 2006, to build and operate a quarry and marine terminal at Whites Point on Digby Neck in Nova Scotia on the Bay of Fundy.

7.   In its submissions, Bilcon proposed that the project would have a duration of 50 years,[6] with operations, including shipping, running from years 2 to 49.[7] According to Bilcon's submissions, Whites Point would have annual production of 2.0 million tons-per-year.[8] This output would be comprised of crushed stone of various types, grits, and sand.[9] █████████████████████████████████
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[6] **R-581**, Revised Project Description, pp. 6-7.

[7] **R-581**, Revised Project Description, pp. 52-54.

[8] **R-581**, Revised Project Description, p. 40.

[9] **R-581**, Revised Project Description, p. 40.

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8.   Bilcon stated in its filings that the destination market was New Jersey.[13] In order to meet its

shipping needs, ██

██.[14] ███████████████████████

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III.   Review of the Tamarack and Rosen Reports: Inconsistencies and Unreasonable Assumptions

9.   The starting point for my analysis was the Tamarack Report and the Rosen Report. The approach

by which the freight rates quoted in the Tamarack Report were derived is summarized in the Tamarack

Model.[16]

10.   I compared the assumptions used in the Tamarack Report with the 2004 Bilcon business plan as

well as Bilcon's 2006 EIS and related documents.

11.   I conclude that the Tamarack Report relies on problematic assumptions in three main areas to

calculate shipping rates: ██. The results

of these calculations, along with additional assumptions, are incorporated into the Rosen Report. The

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[10] **R-575**, Whites Point Quarry & Marine Terminal, Environmental Impact Statement, Volume I – Plain
Language Summary, March 31, 2006, p. 4; **R-581**, Revised Project Description, p. 137.

[11] **R-212**, Environmental Assessment of the Whites Point Quarry and Marine Terminal Project, Joint Review
Panel Report, October 2007, p. 1.

[12] ██
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[13] **R-581**, Revised Project Description, p. 6.

[14] **R-579**, Whites Point Quarry & Marine Terminal, Environmental Impact Statement, Volume VI, March 31,
2006, Chapter 9.2.14, p. 135; **R-581**, Revised Project Description, p. 137.

[15] **R-581**, Revised Project Description, pp. 135, 137.

[16] **C-1108**, Tamarack Excel model, Freight Rate Calculation.

assumptions made in the Tamarack and Rosen Reports are set out in greater detail below, where I highlight some of the more important inconsistencies and problems.

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12.   The Tamarack Report calculates freight rates on the basis of ████████████████ aggregates transported from the Whites Point Quarry to New York and New Jersey. The Tamarack report also assumes that ██ ████████████████████████████

13.   ██ ████████████████ ██

14.   In addition, the Rosen and Tamarack Reports use inconsistent assumptions with respect to ██████████████ The Rosen Report accounts for ██████████████████████████████

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[17] Tamarack Report, p. 11.

[18] **R-717**, Business Plan for Whites Point Quarry, Prepared by Clayton Concrete, April 2004. **R-580**, Whites Point Quarry & Marine Terminal, Environmental Impact Statement, Volume VII, March 31, 2006 ("EIS Volume VII"), Chapter 11, p. 20.

[19] **R-580**, EIS Volume VII, Chapter 11, p. 20.

[20] Rosen Report, ¶ 5.13 (Figure 5.1).

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18. Freight costs corrected for ████████████ using the Tamarack Model are shown in section IV.A of this report.

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19. Bunkers are an oil product that is burned in a ship's main engines to provide power to drive the ship while steaming, during anchorage, and while loading and discharging. The bunker burned in the main engine of the vessel is the Intermediate Fuel Oil (IFO). A second type of bunker, Marine Diesel Oil (MDO), is burned in the vessel's generators when the vessel is at port, during anchorage, and while loading and discharging.[22] Bunker prices are correlated with the price of oil as well as to regulatory requirements. These prices are quite volatile.

20. The Tamarack Report uses ██

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[21] Tamarack Report, p. 11.

[22] **C-1109**, Shift Staff, Details of ████████████ , specifies that ████████████ burns IFO by 34.5 tonnes/day at sea, 3.5 tonnes/day in port, and 5.5 tonnes/day when loading/discharging. The ship burns 0.1 tonnes/day of MDO per day in port, and 0.1 tonnes/day when loading/discharging (tonnes refers to metric tons).

[23] **C-1108**, Tamarack Excel model, Freight Rate Calculation, cells B35 (IFO380) and B36 (MDO).

However, it does not provide documentation of its sources. I was not able to replicate the figures quoted in the report.

21.   In my attempts to determine the source of the Tamarack Report's ███████████████

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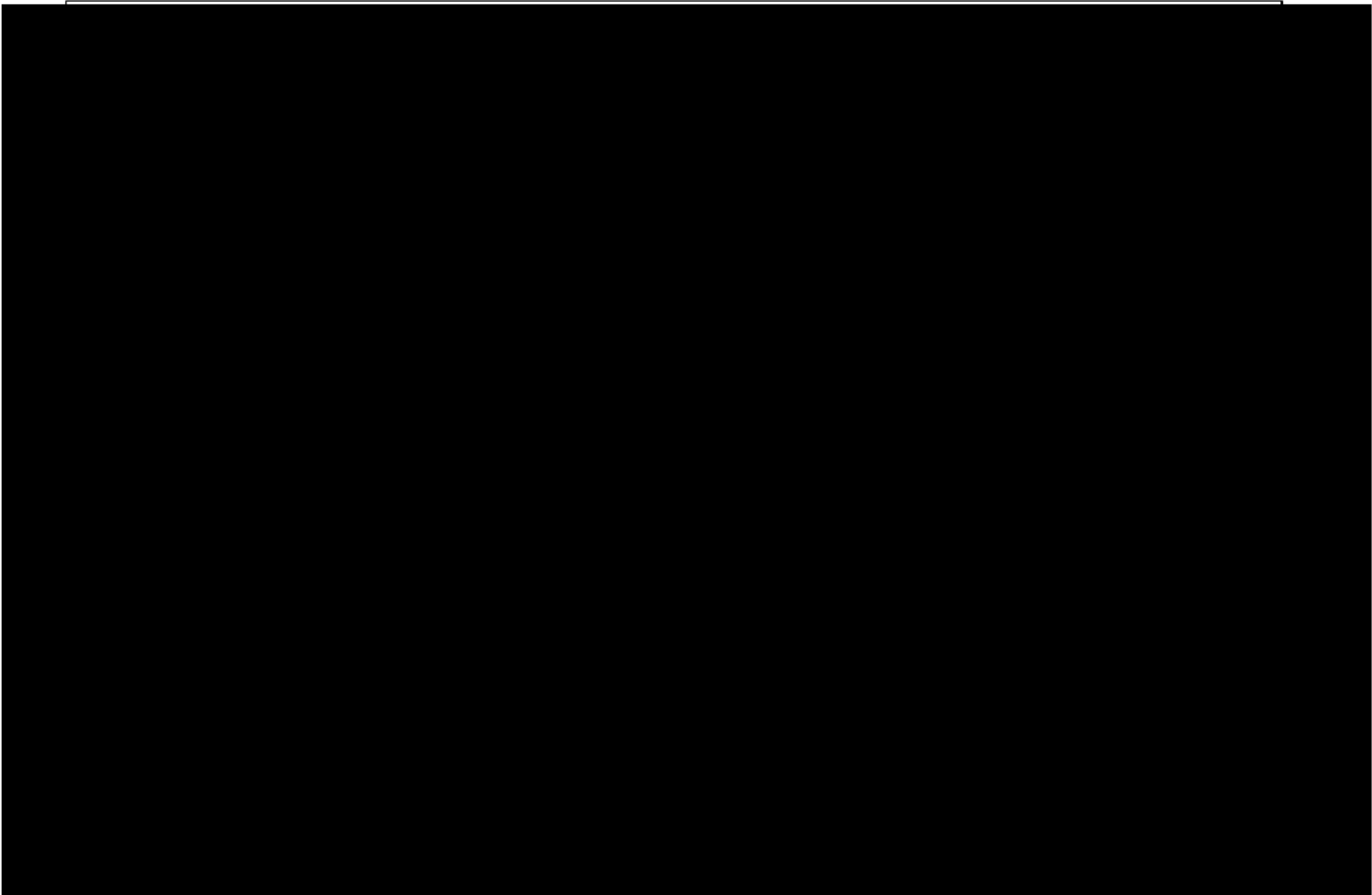
Figure 1, New York Bunker Price 380cSt, HSFO[24]

22.   ██

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[24] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input IFO ULS".

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24.   In addition, the Tamarack Report did not account for ████████████████████████████████

██ The North American

ECA was established in 2009 pursuant to Annex VI of the International Convention for the Prevention of

Pollution from Ships ("MARPOL"). All vessels subject to MARPOL operating within the North American

ECA would be required to use fuel oil with a sulfur limit not exceeding 1.00% by July 1, 2010, and not

exceeding 0.1% by January 1, 2015.[26]

25.   The first round of standards under MARPOL Annex VI were adopted in 1997 and entered into

force in 2005. They involved maximum allowable sulfur concentrations in marine fuels, making it known

in the shipping industry prior to 2007 that ships trading near the Canadian and U.S. East Coast would be

subject to ultra-low sulfur regulations.[27] In my opinion, the limits eventually adopted a few years later

should have been expected by Bilcon prior to 2007.

26.   ██

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[25] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input MDO." The industry benchmark MDO price in the United States is from the Philadelphia market, as shown in the tab.

[26] **R-682**, Update on North American Emission Control Area Enforcement and Fuel Availability Guidance, July 2012, p. 1.

[27] **R-683**, United States Environmental Protection Agency, International Standards to Reduce Emissions from Marine Diesel Engines and Their Fuels, p. 1.

[28] **R-684**, Ship & Bunker website excerpt, "New York Bunker Prices", IFO380, available at: https://shipandbunker.com/prices/am/namatl/us-nyc-new-york.

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C.   ████████████████████████████

29.   The Tamarack Report estimates Bilcon's freight costs based on ████████████████████

██.[30] I was not

able to confirm that this figure represents a relevant commercial benchmark for the project because

there was insufficient documentation provided by Tamarack to support ████████████████████

30.   The Tamarack Report appears to have based the ██████████████████████████

██████████████████████████████████████y. These figures are inputs to

the Tamarack Model.[31] There is, however, no documentation of ██████████████ in the Tamarack

report.

31.   I was able to verify the ██████████████████████████ input. I used Marsoft databases to

confirm the ██

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[29] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input IFO ULS", cell H7.

[30] **C-1108**, Tamarack Excel model, Freight Rate Calculation, tab "2010", cell B23.

[31] See **C-1108**, Tamarack Excel model, Freight Rate Calculation, tab "2010", cells B22 and B23.

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32.   A key problem with ██

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D.   Long-Term Freight Costs Used in the Rosen Report.

34.   The Tamarack Report does not provide projections for charter rates beyond the first 10 years of the project life. It provides rates only from 2010 to 2020, ██████████████████████████████

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████████████████████. Global shipping rates do not move in parallel with inflation.

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[32] The average Time Charter rates referenced in **C-1110** are annual average S5TC rates (with relatively small rounding differences). See **C-1110**, Email from Edward Scott-Hansen to Philip Syrrist re: average TC rates on a Supramax from 2010 to 2016, October 8, 2016.

[33] Tamarack Report, pp. 11-13.

[34] Rosen Report, ¶ 5.23.

36.   Figure 2 compares the year-on-year percentage change of the S5TC spot rate and of the U.S. consumer price index ("CPI")[35] from 1998Q4 to 2007Q3, the 10-year period prior to the Bilcon shipping project. The CPI percentage changes showed a relatively stable trend around 2.6% during this period, while the S5TC rate percentage changes displayed a high level of volatility and little correlation with the CPI changes.
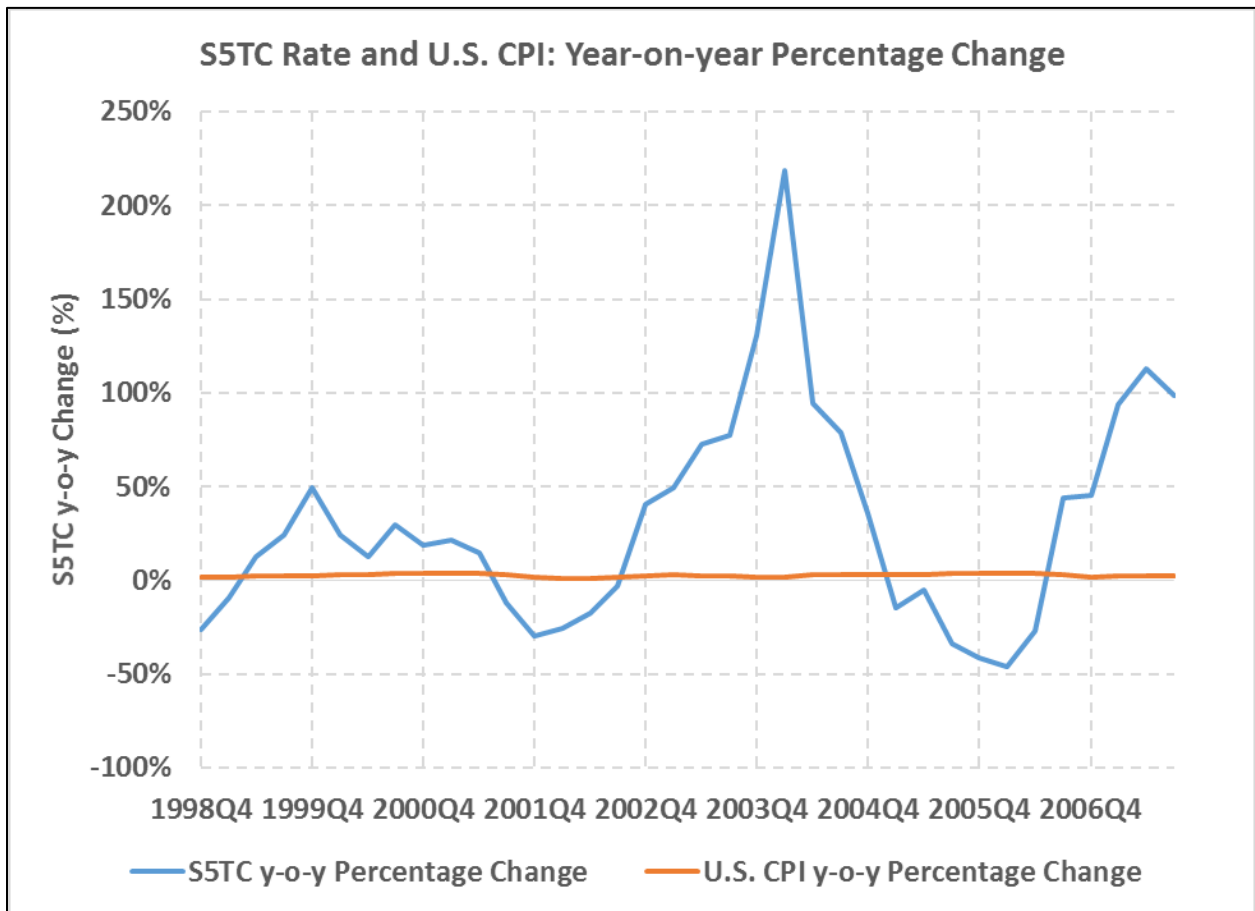
Figure 2, S5TC Rate and U.S. CPI: Year-on-year Percentage Change[36]

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[35] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input CPI".

[36] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input Vsl Hist 17Q1". Row 10 shows the year-on-year change in S5TC rates.

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37.   The Tamarack Report does not mention ████████████████████████████

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IV.   Correcting Faulty Assumptions in the Tamarack Report Significantly Increases the Bilcon Freight Rate.

39.   The Claimants' freight rates based on corrected input assumptions to the Tamarack report are documented in this chapter. The results show that using corrected inputs in the Tamarack Model results in significantly higher freight rates than those calculated by Tamarack.

40.   The Tamarack Report is, in my opinion, based on an incorrect methodology that overlooks the economic link between ██. This point is addressed in section V.

A.   ████████████████████████████████

41.   Documents existing in 2007, including Bilcon's 2004 business plan and its 2006 EIS, refer to ██ These figures represent the best available information for project decision makers as of 2007.

42.   However, the Tamarack Report ██

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43.   The Rosen Report assumes ████████████████████████████████████

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44.   Tamarack's assumption that ████████████████████████████

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45.   I understand that the quarry's 50-year life would end in the middle of 2059. Accordingly, the

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46.   Figure 3, Shipment Volume and Voyage, summarizes the different assumptions used by the Claimants and the corrected assumptions I used based on EIS numbers in their model.
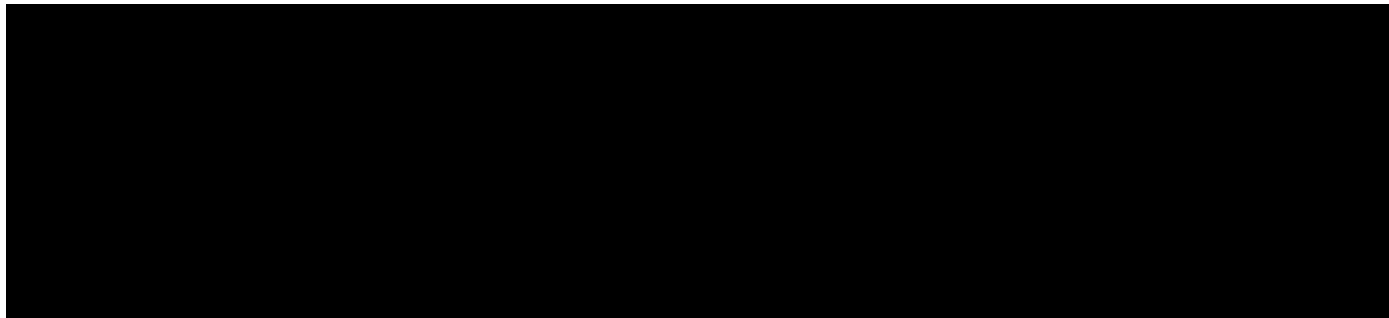
Figure 3, Shipment Volume and Voyage

47.   Figure 4, Sensitivity of Freight Costs from the Tamarack Model to Cargo Size Transported per Voyage, shows ██. The Tamarack Model estimates that freight costs as of 2010 █████████████████████████ were

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[37] Rosen Report, ¶ 5.13 (Figure 5.1).

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48.   The ████████ number appears in Figure 4 below corresponds to ████████████████████

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49.   I utilized the Tamarack Model to run sensitivity analyses based on ████████████████

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Figure 4, ██[41]

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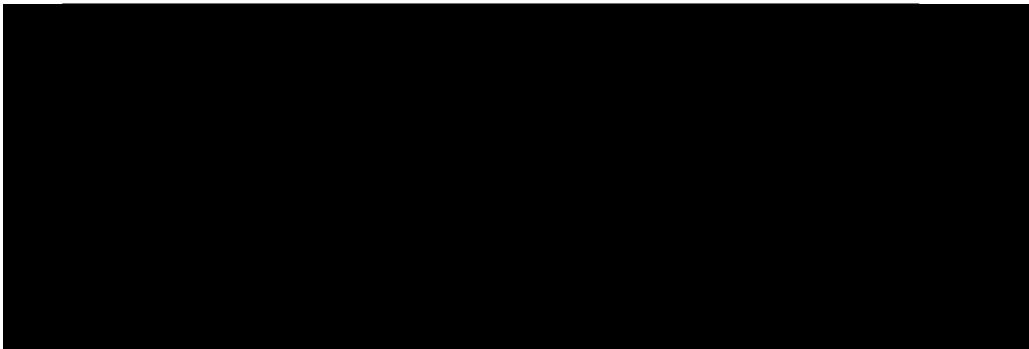
50.   I then utilized the Tamarack Model to run sensitivity analyses based on ████████████

████████████   I expanded Figure 4, ███████████████████████████████████

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[38] **C-1108**, Tamarack Excel model, Freight Rate Calculation, tab "2010", cells B62, E62 and I62.

[39] I have presented arithmetic averages in the body of the report for ease of comparison. The detailed freight rates for each destination port that reflect all of our corrections can be found in a modified version of the Tamarack Model that I prepared, **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "2010".

[40] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Output."

[41] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Output", Input for Tamarack Model and Intermediate Output for Report, Rows 25 and 26.

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The columns in Figure 5, ██

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51.   To capture the impact of the MARPOL Annex VI regulations, ████████████████████████

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[42] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Input IFO ULS".

[43] See Figure 5.

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55.   This analysis shows that correcting the Tamarack Report assumptions to reflect ███████

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maximum of ████████ – an increase of almost ██████

Figure 5, ██

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56.   As noted above, I have been instructed to consider the shipping rates from the vantage point of

October 22, 2007, not 2010 as assumed by Tamarack. ████████████████████████████████

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1.   Adjustment to the ███████████████████████

57.   ███

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[44] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Output", Input for Tamarack Model and Intermediate Output for Report, Rows 25 and 26.

[45] See **C-1108**, Tamarack Excel model, Freight Rate Calculation, tab "2010", cell B22; **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input Vsl Hist 17Q1."

[46] See **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Input Vsl Hist 17Q1", cells DG5 to DJ5.

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██████████████████████████████ I see no economic basis for this conversion ratio. However, should Tamarack provide a rational economic explanation for its approach, I may revise my adjustment accordingly.

2.   ████████████████████████████████████

58.   Figure 6, Sensitivity of Freight Costs from the Tamarack Model to ██████████████, is similar to Figure 5. It shows the sensitivity of the freight costs as of 2010 from the Tamarack Model to ████████ ██████████████████. The rows in the figure are based on the ████████████████ ████████████████. The freight costs are simple averages of the costs to three receiving ports.

59.   I found that:

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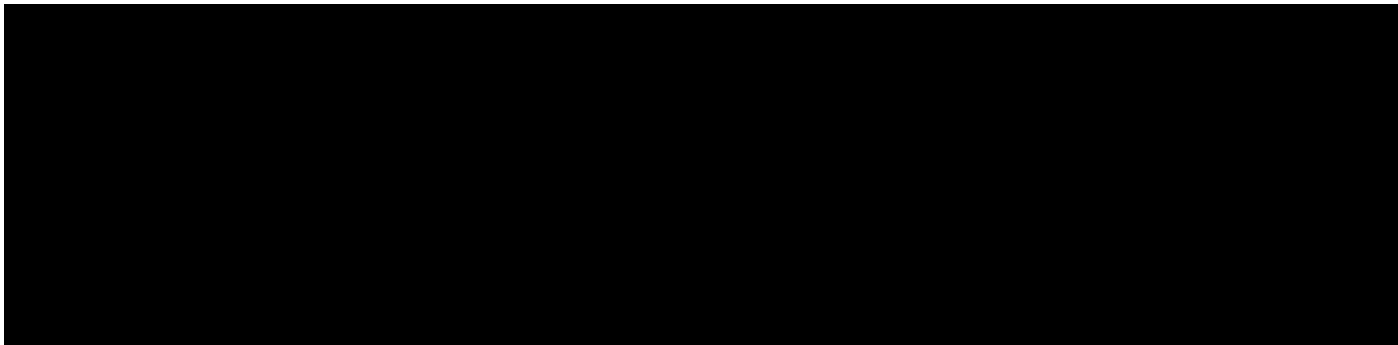
Figure 6, Sensitivity of Freight Costs from the Tamarack Model to █████████████ [47]

[47] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Output", Input for Tamarack Model and Intermediate Output for Report, Rows 26 to 28.

D.   Conclusions

60.   I have shown in this section that the Tamarack Model relies on unreasonable assumptions of

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████████████████ which all lead to an understatement of the project's freight cost.

61.   Figure 7, Long Term Freight Cost Comparison: Tamarack, FTI and Tamarack Corrected, shows the long-term forecasts derived by the Tamarack methodology and used in the Rosen Report, and compares it to the forecasts derived using the Tamarack methodology but using corrected values as discussed above. It shows that:

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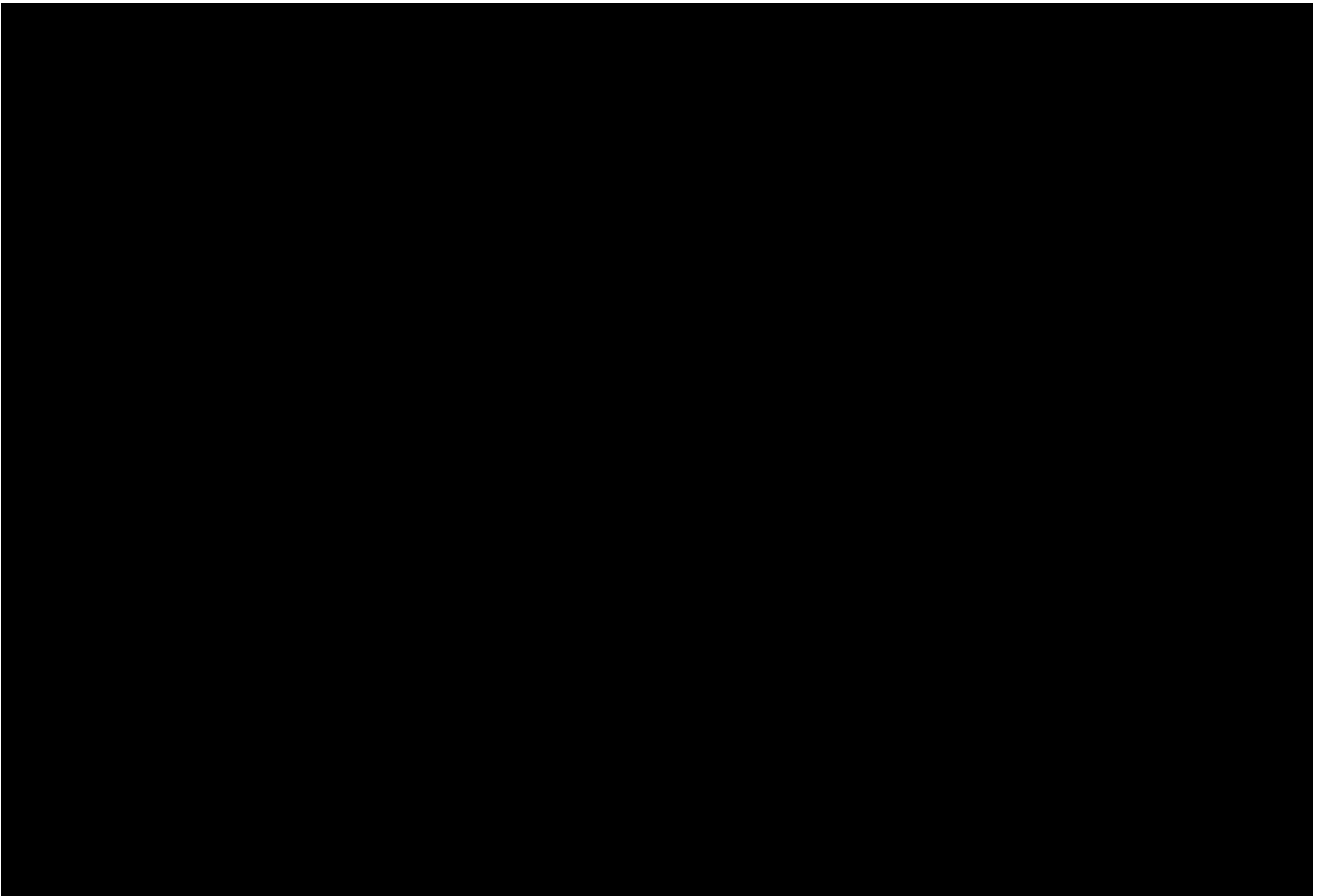
Figure 7, Long Term Freight Cost Comparison: Tamarack, FTI and Tamarack Corrected[48]

62.   The very wide range in freight rate estimates reflects, in part, the weakness of the Tamarack Report's methodology. In particular, this analysis demonstrates that it would be untenable to take the Tamarack approach in the real world if one were to ship regularly over the life of a 50-year project. In the following section, I propose a methodology for calculating freight rates based on ▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮which would have been more appropriate for the Bilcon project given its assumed long-term, stable shipments.

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[48] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Output Freight Costs Comp".

V.   Bilcon's Freight Rates Should Reflect ████████████████████ ████

63.   A reasonable way to meet the transportation needs of the long-term Bilcon project with frequent shipments and a 50-year life span would have been ████████████████████████ ██ ██████████████████████████

██ ████████████████████████████[49] ████████████████████████ ██[50] ██ ██ ████████████[51] ██ ██████████████████████████[52]████████████████████████ ██

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[49] **R-717**, Business Plan for Whites Point Quarry, Prepared by Clayton Concrete, April 2004.

[50] **R-578**, Whites Point Quarry & Marine Terminal, Environmental Impact Statement, Volume V, March 31, 2016, Chapter 7, p. 12; **R-581**, Revised Project Description, p. 137.

[51] **R-686**, Drewry Shipping Insight, Newbuilding Contracts, October 2007.

[52] Tamarack Report, ¶ 1.

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Figure 9, Sensitivity of Freight Costs as of 2010 from the Tamarack Model ████████████████████████████████ [54]

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[54] **R-685**, Marsoft Inc., Adjusted Tamarack Model, tab "Output".

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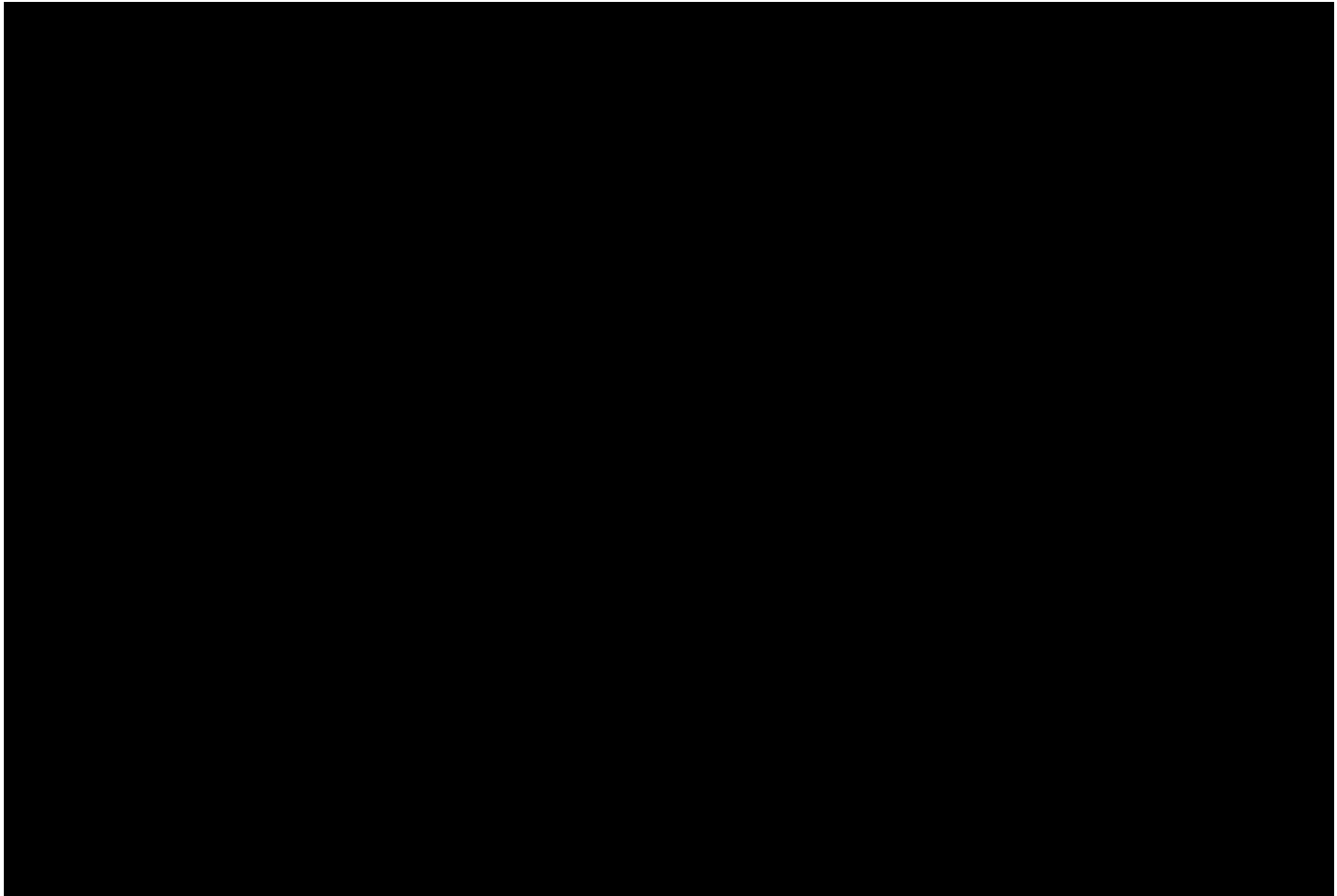
Figure 10, Long Term Freight Cost Comparison: Tamarack vs. Capital Cost Methodology[55]

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[55] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Output Freight Costs Comp".

[56] See Figure 17.

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VI.   Conclusions.

73.   To evaluate the projected shipping freight costs provided by the Claimants, I conducted my analysis from the vantage point of October 22, 2007, which I understand is the date that the measures the Tribunal in this case identified as a breach of Canada's obligations under Chapter 11 of NAFTA were adopted.

74.   I have reviewed reports filed by the Claimants in 2016 in this arbitration, including the Tamarack Report and its accompanying model, the Rosen Report, as well as earlier documents prepared by Bilcon, including a 2004 Bilcon business plan, Bilcon's 2006 EIS, and other related documents. The Tamarack Report is the primary shipping cost reference and is the basis for Rosen's shipping cost calculations.

A.   The Tamarack Freight Rate Model Is Inconsistent.

75.   The Tamarack Report makes several assumptions which are not consistent with the Bilcon business plan and conditions existing at the time of the breach:

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[57] The methodology is explained in detail in Attachment 1: The Capital Cost Methodology for Estimating Freight Costs.

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76.   I revised the inputs to the Tamarack Model to reflect ████████████████████████

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Figure 11, Freight Rate Comparison: Under Tamarack Assumptions and Market Conditions

77.   Tamarack then applies ███████████████████████████ on top of the freight cost estimate as of 2010 to derive a time series from 2011 to 2020 for Bilcon.

78.   Tamarack does not provide a forecast beyond 2020. Were the ███████████████████ ██. ██ ██ ██████████████. I've shown that there is no basis to link shipping rates to the inflation rate.

79.   In sum, correcting the inconsistencies in the Tamarack Model result in a maximum increase in the 2010 freight rate █████████████████████████ Over time, that rate would have increased from ██ ██████[58]

80.   I conclude that Bilcon's freight costs based on the Tamarack Model and Tamarack inputs are unrealistic. They do not correctly account for ████████████████████████████ ████████████████████

81.   This extremely wide range of cost estimates reflects the fact that the Tamarack Model is not ██ ██ █████

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[58] **R-681**, Marsoft Capital Cost Model - Bilcon Ship Freight Costs, tab "Output Freight Costs Comp".

82.   In the section below, a Bilcon freight cost is developed on a consistent ███████████

B.   Anchoring the Tamarack Model on the Capital Cost to ████████████████████
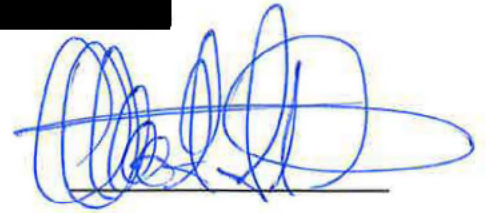
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Dr. Arlie G. Sterling

June 9, 2017

Attachment 1: ███████████████████████ for Estimating Freight Costs

88.   A reasonable way to meet the transportation needs of the project would have been █████████ ██ ███████. The following section of this report analyzes the freight cost estimates under this approach (the ██████████████████████ which consists of the following cost components:

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[59] **R-681**, Marsoft Capital Cost Model - ████████████████████████████

[60] The inflation rate for October 22, 2007, **R-687**, "10-Year Breakeven Inflation Rate", Federal Reserve Bank of St. Louis, October 22, 2007, available at: https://fred.stlouisfed.org/series/T10YIE.

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[61] **R-681**, Marsoft Capital Cost Model - ██

[62] **R-681**, Marsoft Capital Cost Model - ███
Our research shows ██
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[63] **R-681**, Marsoft Capital Cost Model - ███████████████████████████████

[64] Deadweight tonnage (dwt), the sum of the weights a vessel can safely carry.

[65] **R-681**, Marsoft Capital Cost Model - ███████████████████████████████

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[66] **R-681**, Marsoft Capital Cost Model - ███████████████████
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[67] **R-681**, Marsoft Capital Cost Model - █████████████████████████████

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[69] **R-681**, Marsoft Capital Cost Model - ██████████████████████████████████
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[70] **R-681**, Marsoft Capital Cost Model - ██████████████████████████████████
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[71] **R-681**, Marsoft Capital Cost Model - ██
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[72] **R-681**, Marsoft Capital Cost Model - ████████████████████████
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[75] **R-681**, Marsoft Capital Cost Model - ████████████████████████████
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[76] **R-681**, Marsoft Capital Cost Model - ████████████████████████████
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[77] **R-688**, World Economic and Financial Surveys, World Economic Outlook October 2007, Globalization and Inequality, p. 41, figure 1.19.

[78] **R-681**, Marsoft Capital Cost Model - ████████████████████████████

[79] **R-681**, Marsoft Capital Cost Model - ████████████████████████████

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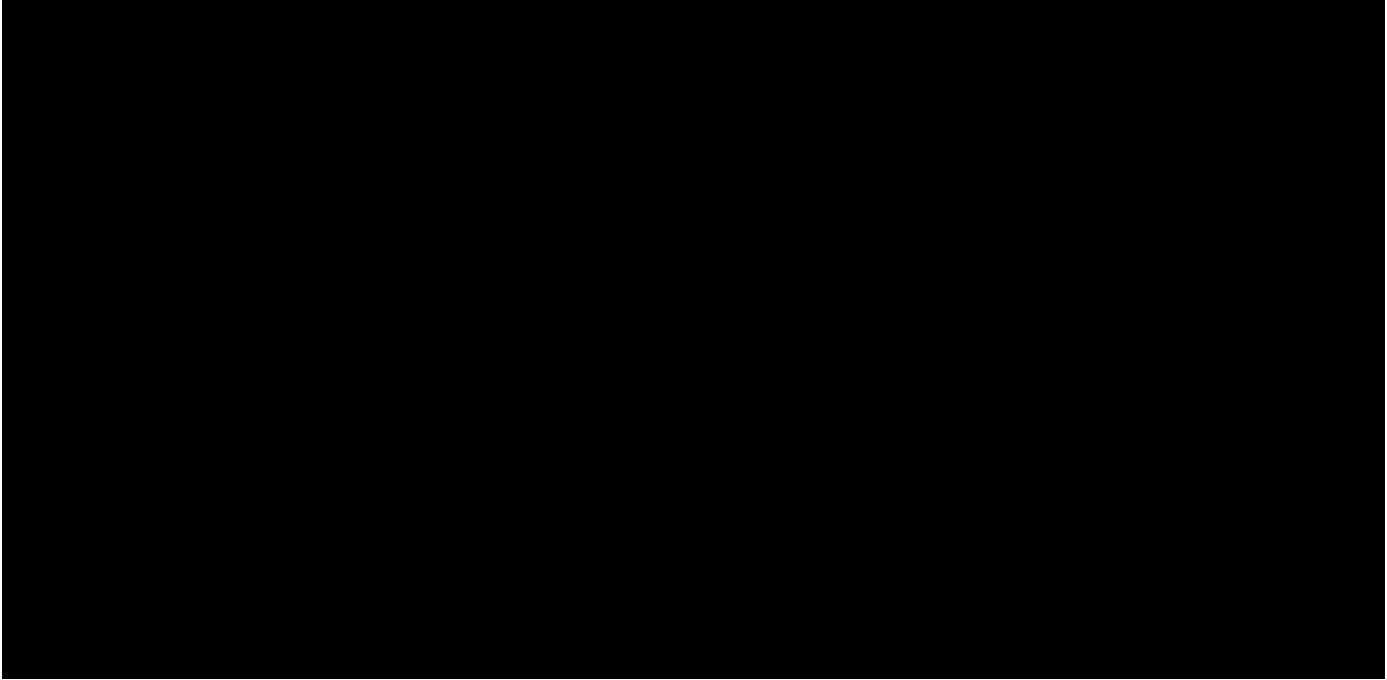
[80] **R-681**, Marsoft Capital Cost Model - ████████████████████████████

[81] **R-689**, U.S. Energy Information Administration, Marine Fuel Choice for Ocean Going Vessels within Emissions Control Areas, page vii.
https://www.eia.gov/analysis/studies/transportation/marinefuel/pdf/marine_fuel.pdf

[82] **R-681**, Marsoft Capital Cost Model - █████████████████████

[83] **R-681**, Marsoft Capital Cost Model - █████████████████████

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[84] **R-681**, Marsoft Capital Cost Model - ████████████████████████████████

[85] **R-681**, Marsoft Capital Cost Model - ████████████████████████████████

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[86] **R-689**, U.S. Energy Information Administration, Marine Fuel Choice for Ocean Going Vessels within Emissions Control Areas, page vii, available at: https://www.eia.gov/analysis/studies/transportation/marinefuel/pdf/marine_fuel.pdf.

[87] **R-690**, International Maritime Organization, IMO sets 2020 date for ships to comply with low sulphur fuel oil requirement, available at: http://www.imo.org/en/mediacentre/pressbriefings/pages/mepc-70-2020sulphur.aspx.

I.   Freight Costs Estimates by the ████████████████

124.   Figure 15, Freight Cost Estimates by Year, shows the year-by-year freight costs under these scenarios, using ███████████████████████████████████ Refer to Figure 17 for the annual figures.
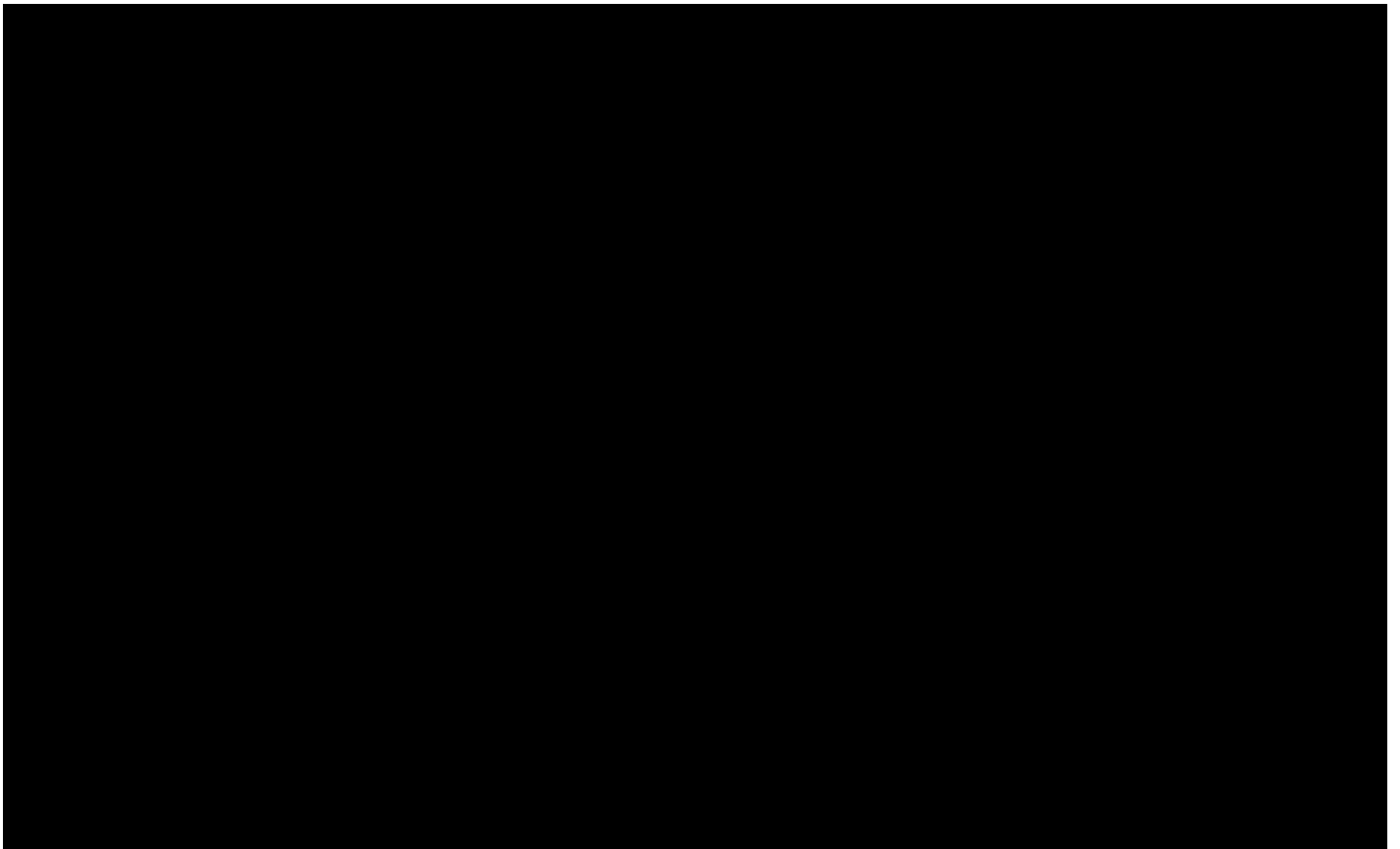
Figure 15, Freight Cost Estimates by Year

Figure 16 below explains the reason behind the downward and upward movements in the freight cost estimates year by year.
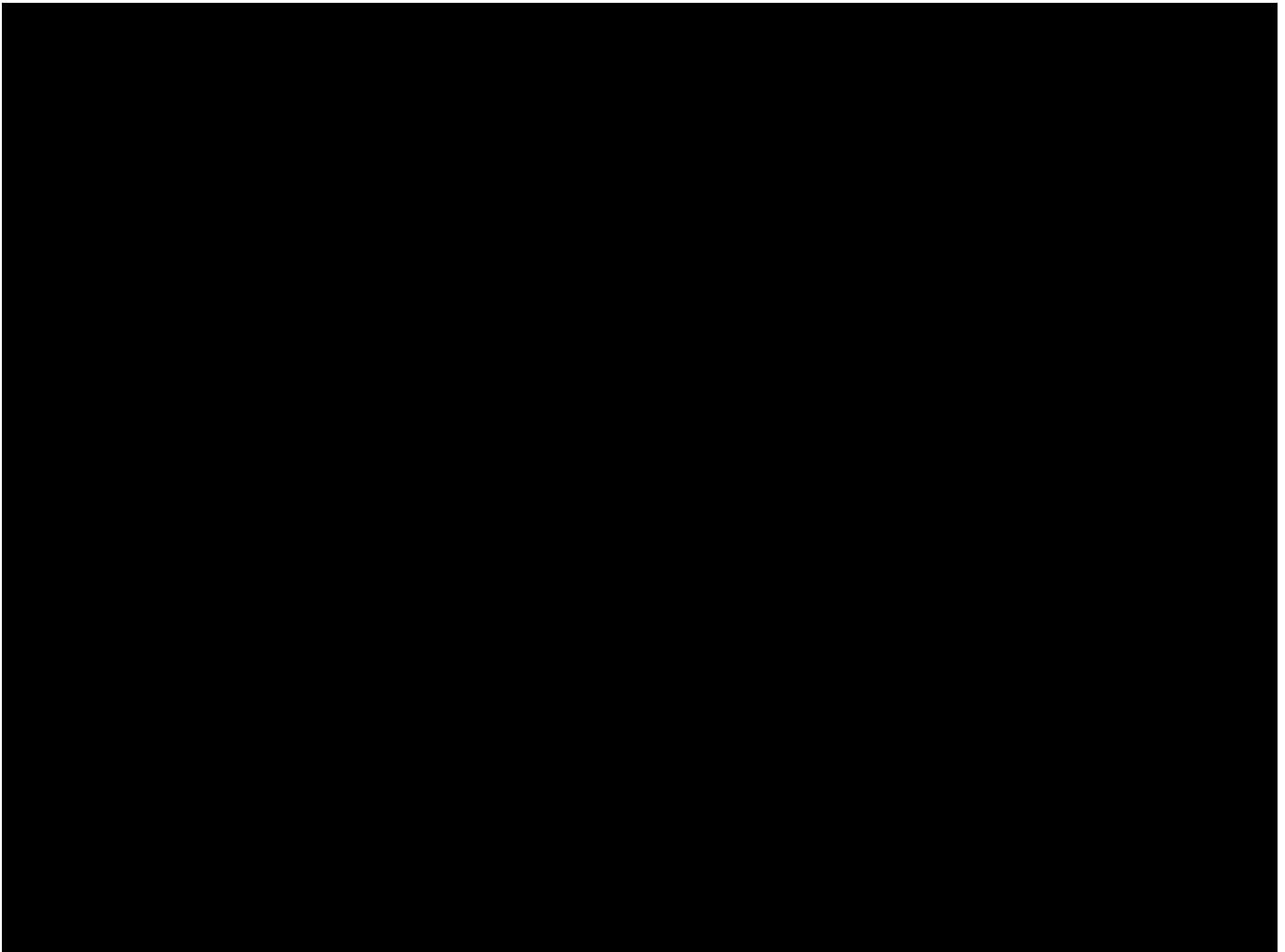
The figure below shows the annualized freight costs estimates using ███████████████████████████████████████
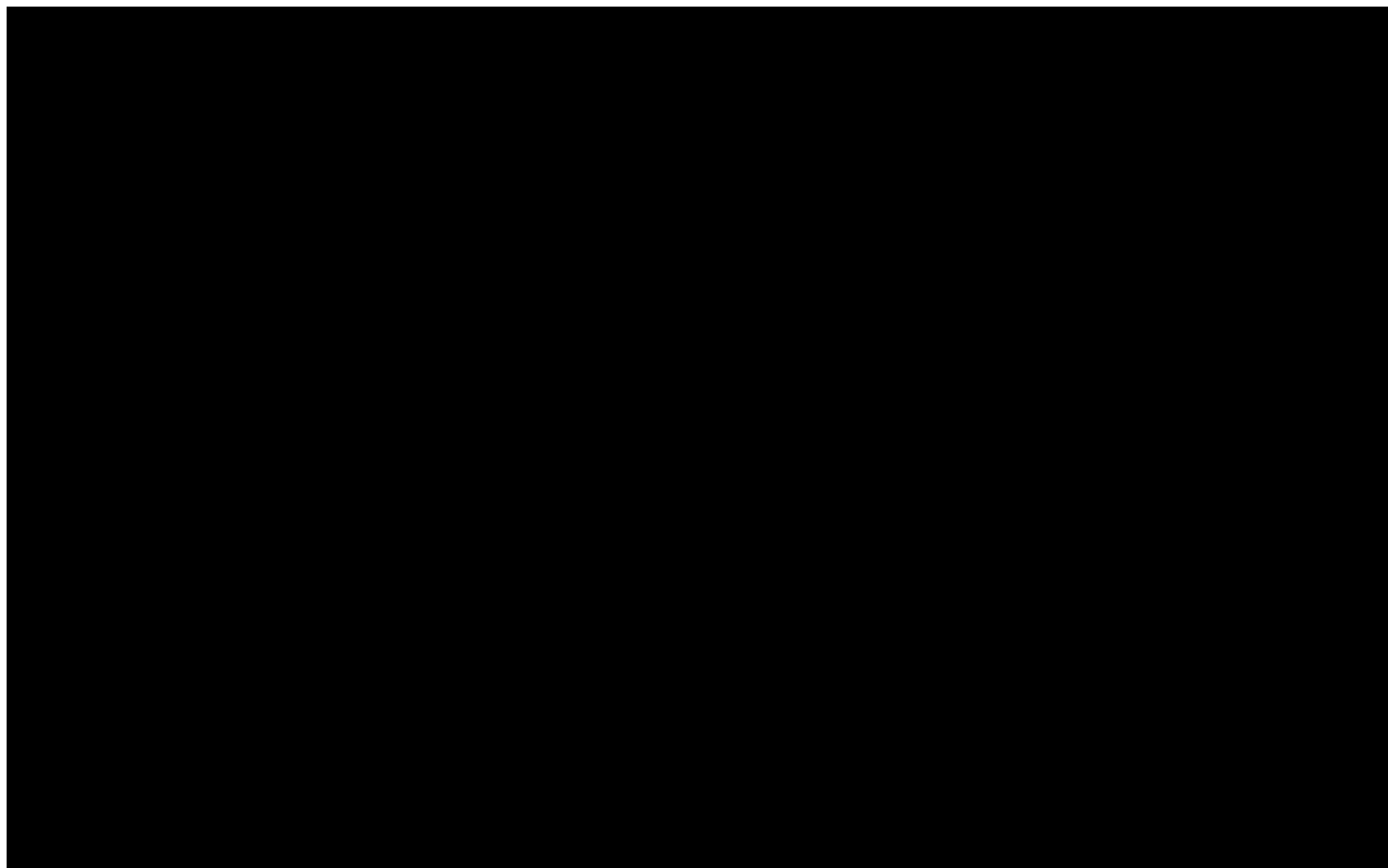
Figure 17, Freight Costs under the ██████████████████████ █████████████████████████████████████

The figure below shows the annualized freight costs estimates using the ███████████████████████████████

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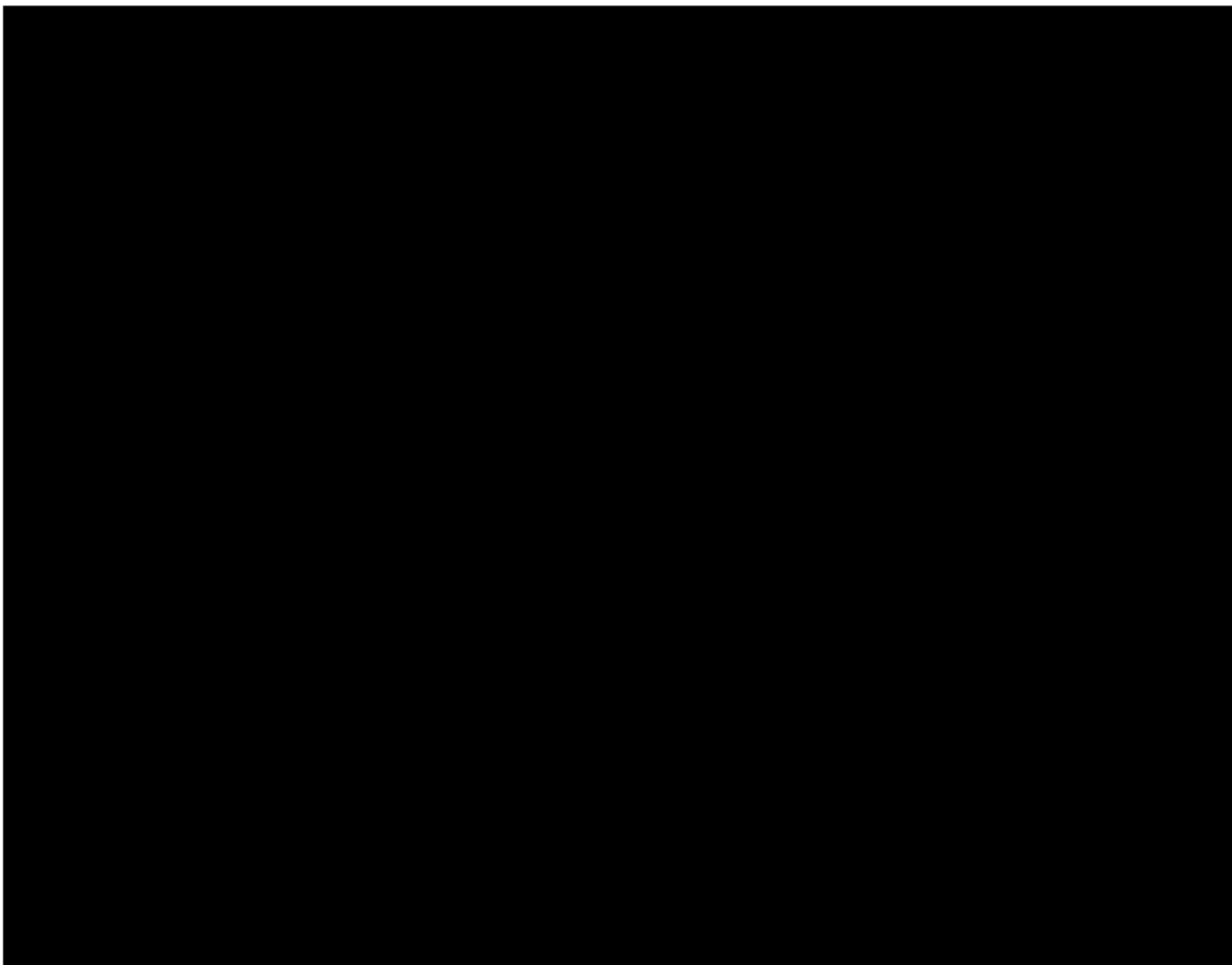
Figure 18, Freight Costs under the ██

The figure below shows the annualized freight costs estimates using ███████████████████████████
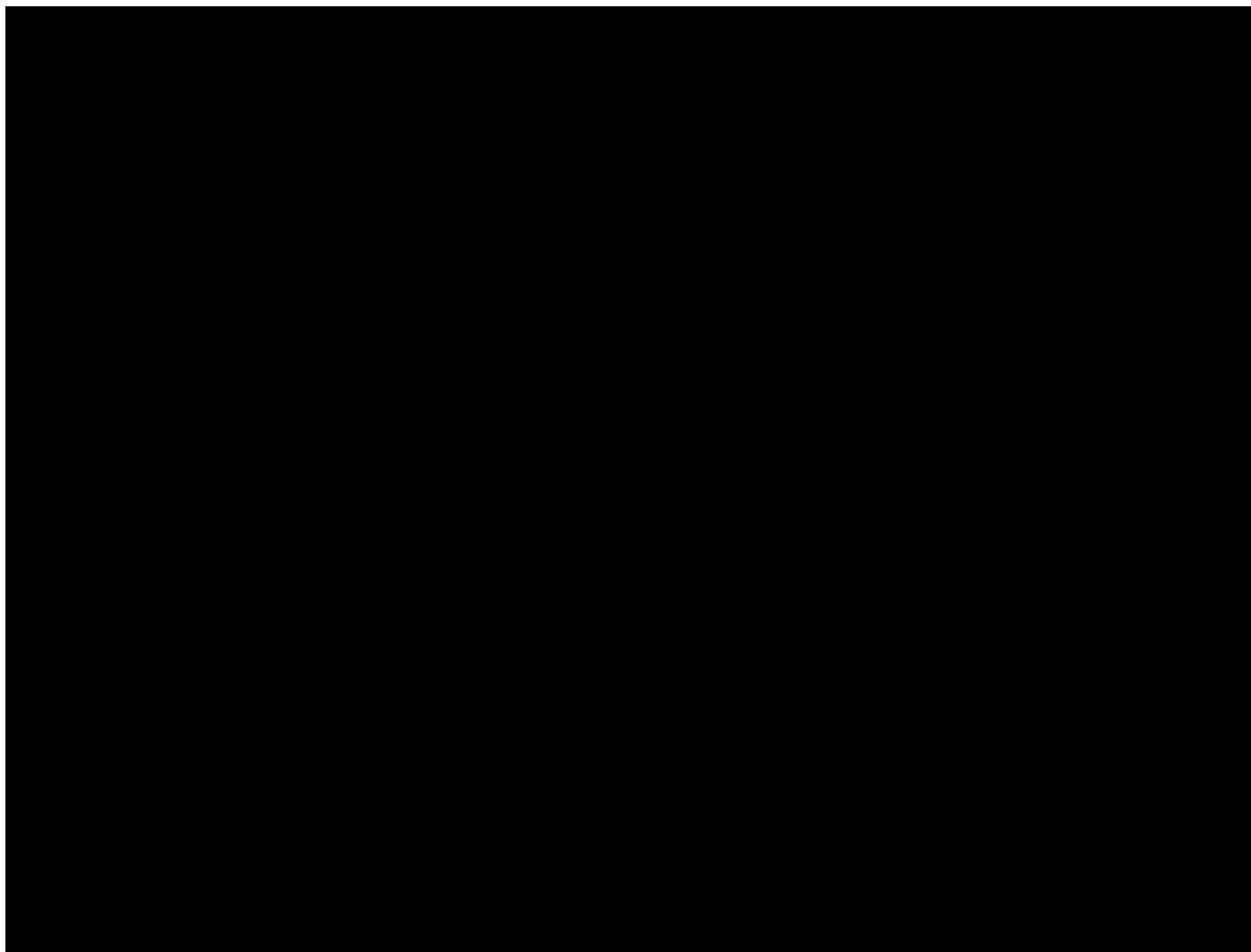
Figure 19, Freight Costs under the ███████████████████ ████████████████████████

Attachment 2: Arlie G. Sterling CV

Arlie G. Sterling

President,	Marsoft	Inc.

BOSTON, MA	**+1.617.369.7800**	**Arlie.Sterling@marsoft.com**

Dr. Arlie Sterling is the President and co-founder of Marsoft Incorporated. He leads the development and commercialization of Marsoft's decision support and risk management services for the shipping and ship finance markets. Dr. Sterling advises shipowners, investors, and financial institutions on the development and execution of effective investment, chartering, and risk management strategies. He holds a Ph.D. in Applied Economics from the Sloan School of Management at Massachusetts Institute of Technology (MIT), an M.S. in economics from Northwestern University, and a S.B. in economics from MIT.

Dr. Sterling is a member of the board of BalticMax Holding Company Ltd.

AREAS OF EXPERTISE

- Shipping Markets
- Investment and Chartering Strategy
- Credit Rating, Portfolio Management for Ship Finance
- Debt Restructuring and Refinancing
- Cost of Capital and Cost of Service

EXPERIENCE

Cycle Management

Consulting and advisory on market prospects and timing-critical investment and chartering decisions. Develop and explicate the quantitative models of shipping markets to support market forecasting and risk assessment. Predict investment performance on a stand-alone or portfolio setting, and the debt capacity of alternative investment/chartering options.

Credit Risk Evaluation and Management

Development of risk analytics and deal evaluation/portfolio management systems for the highly fragmented and volatile maritime shipping markets. Design, implement, and evaluate Probability of Default and Loss Given Default models accounting for expected market outcomes and uncertainties. Calculate the long-term value of the collateral as well as repossession costs, and risk mitigation value of covenants and charters.

Investment and Restructuring

With Lehman Brothers organized the Diogenes Tanker Fund on behalf of institutional investors in the United States and Asia. Co-led the team to restructure and refinance $450 million debt portfolio for a leading European bank. Support for numerous refinancing efforts.

Expert Witness

Expert testimony regarding the risks and cost of capital for shipping as well as fleet earnings potential and risk factors including the relevance and quality of alternative market benchmarks and analysis.

Management

Founder and Sponsor (with Peter Lorange) of the *Investment and Risk Management in Shipping Program* for management development.

PROFESSIONAL AFFILIATIONS

- American Economic Association
- Connecticut Maritime Association

PUBLICATIONS

Modigliani, Franco and Arlie Sterling. "Government Debt, Government Spending and Private Sector Behavior: Comment" American Economic Review vol. 76 no 5 (Dec 1986).

"Stocks vs. Ships – Which is a Better Investment?" *Marine Money*, vol. 8, No. 8, April 1992.

"Cycle Management in Shipping" with Dr. Peter Lorange. *Marine Money*, Aug 2010.

"Crisis, a Time to Change – Part 2" with Paulo Fernandes, Petrobras *Marine Money* April 2010.

"Vale's Shipping Strategy – Creating a Competitive Advantage?" *Marine Money*, Oct 2011.

"Making a Fortune in Shipping – Marsoft's Contribution" *Marine Money* Jan 2011.

SPEECHES/PRESENTATIONS

"Dry Bulk Orderbook: What Does It Mean?" Sponsored by Nedship Bank, Dec 1994.

"Shipping Markets: Performance and Prospects" Citibank High Yield Conference, New York, 1998.

"Dry Bulk & Tanker Market Overview: Prospects for Shipping in the New Millennium" Exposhipping 2000, Istanbul, April 2000.

"Opportunities & Risks" Marine Money & Vereinsund Westbank Hamburg Ship Finance Conference, Hamburg, February 2003.

"The Rising Wave in Shipping: Key Drivers" Merrill Lynch Shipping Program, Chicago, April 2005.

"Industry Perspective on China's Maritime Energy Transport" Maritime Implications of China's Energy Strategy, United States Naval War College, Newport, December 2006.

"How will Shipping Survive the Perfect Storm?" Hellenic Norwegian Confab, Annual Joint Shipping Conference of the Hellenic-American and Norwegian American Chambers of Commerce, Feb 2009.

"Managing Through the Cycles" Nanyang University Vision and Roadmap for R&D Priorities, Singapore, March 2010.

"Shipping Sector Review: Challenges and Opportunities" Bank of America Merrill Lynch Special Situations Conference, London, May 2010.

"Pricing Risk in International Shipping - a Guide for Lenders and Investors" Shipping & Offshore Dealmakers Forum, November 2010.

"The Shipping Markets" Citibank Global Industrials Conference, Boston, September 2011.

"When 20% is really 6%," Steward & Kissel Private Equity Roundtable, New York, May 2012.

"Assessing Market Prospects and Risks" Marine Money Forum Geneva, June 2013.

"China: Economic Growth Prospects and the Impact on Shipping" Marine Money International Forum, Shanghai, Nov 2014.

"The Big Debate: Industry Veterans Debate the Markets" (Moderator), Connecticut Maritime Association Annual Meeting, Stamford, March 2015.

"The Class of 2004/2005 – Financial Performance of Publicly Traded Shipping Companies" MIT Shipping Club, Cambridge, April 2015.

"Shipping Market Trends" Cotignac, the New Davos for Shipping Finance, Tiger Group, Cotignac, May 2015.

"Commercial Banking: Enablers of the "Upside" in Shipping," moderator 28th Annual Marine Money Week New York, June 2015.

 "Shipping Markets and Investments" ING SAIL 2015, Amsterdam, August 2015.

"Changing Investment Opportunities in Shipping," Association of Ship Brokers and Agents, Miami, September 2015.

"Identifying Mis-Priced Assets and Investment Opportunities in Shipping" and "Critical Success Factors for a Shipowner," presentations at the COSCO World Shipping Summit, Guangzhou, November 2015.

"The World Economy, Markets and Expectations for the Dry Bulk Industry – Views from the Trenches" (moderator), Connecticut Maritime Association Annual Meeting, Stamford, March 2016.

"Innovation in Shipping – Understanding Market Cycles and Implications for Investment and Risk Management" Lorange Institute of Business (A member of the CEIBS Group), Zurich, April 2016.

"COSCOCS – Capitalize on the Tanker Market", presentation at the COSCO World Shipping Summit, Shanghai, November 2016.

TESTIMONY

U.S. Federal and State Arbitration

Before the Public Utilities Commission, of the State of Hawaii *Application of Young Brothers Limited for Approval of a General Rate Increase and Certain Tariff Changes in Local Freight Tariff No. 5-A.* December 2008.

Before the US Bankruptcy Court Southern District of New York, *in Excel Maritime Carriers, Ltd.* Declaration as Maritime Expert to the Debtors and Debtors in Possession, Sept 2013.

Before the US Bankruptcy Court Southern District of New York, in *GENCO Shipping & Trading Limited, et al.* July 2014.

Before the U.S. Federal District Court for the District of Delaware in *SeaChange Projects LLC v. United States of America C.A. No. 1:14-cv-01186-GMS*