

Appendix F

Ship Simulation Model

**Draft Interim Feasibility Report
DeLong Mountain Terminal, Alaska
Navigation Improvements**

**DeLong Mountain Terminal Project
Onshore Facilities Feasibility Study Project**

Simulation Report

**AMEC Project Number: A1511
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1.0 INTRODUCTION

This report describes the dynamic simulation model developed by AMEC for the DeLong Mountain Terminal Project for the With Project and Without Project cases and is intended to complement the COE economic section. The following sections describe the basic logic of the simulation model and provide details of how the model behaves given specific events.

Rockwell Software Arena 6.0 software was used to develop the model – a discrete event simulation model. This type of simulation uses the Monte Carlo method, which makes use of random numbers to select model inputs from pre-defined statistical distributions. By repeatedly testing such a model, a statistical distribution can be developed for the solution of multi-variable problems with a probabilistic nature and/or complex relationships between variables. Monte Carlo methods are suitable for simulation of bulk terminals, due to the complex interaction of random meteorological ocean conditions, random breakdowns of terminal equipment, shipping schedules and port operations.

Included in this report are the model validation results, model inputs and model run results for the With Project and Without Project cases.

2.0 SCOPE OF WORK

For the DMT Project Feasibility Study, a simulation model was developed for the With Project and Without Project Condition (WPC) cases. For the With Project case, the following scenarios were run:

- Deep Water Port Case:
 - Dredged channel depths of 47, 50 and 53 feet using terminal throughputs of 1,544,000 tpy and 1,729,000 tpy
- Breakwater Case:
 - Two and three barge scenarios using terminal throughputs of 1,544,000 tpy and 1,729,000 tpy
- Adding additional barges to existing terminal:
 - Three barge scenarios using terminal throughputs of 1,544,000 tpy and 1,729,000 tpy

For the WPC, scenarios were run for throughputs of 1,544,000 tpy and 1,729,000 tpy.

3.0 WITH PROJECT – DEEP WATER PORT

3.1 Model Description

The Deep Water Port (DMT) case simulated the following scenarios:

- Dredged channel depths of 47, 50 and 53 feet using terminal throughputs of 1,544,000 tpy and 1,729,000 tpy

The model simulates terminal operations from the onshore storage sheds through to the arrival and departure of concentrate carrying vessels.

In simplified terms, the model can be separated into two components: onshore and offshore. Onshore, the model generates concentrate at a constant rate to mimic mine production, and deposits the concentrate into the concentrate storage buildings (CSBs). Offshore, the model generates ships to mimic anticipated ship arrivals, and then sends them to berth to be loaded.

The model takes into consideration the following:

- CSB storage size
- Conveyor routing
- Concentrate type
- Loading delays (documentation, surveys, etc.)
- Ship type (Panamax and Handy Size vessels)
- Fuel shipments
- Vessel maneuvering restrictions
- Meteorological conditions (wind speed, wind direction, wave height, current speed, etc.)
- Shipping season length

Other user input is then combined with the model logic described in the following sections to generate output values that are used to evaluate the performance of the DMT terminal.

3.2 Model Logic – Onshore

3.2.1 Mine Production Rates and Throughput

The model generates concentrate at a fixed rate throughout the year and deposits it into each of the CSBs on an hourly basis. This is meant to approximate concentrate deliveries from the mine, which are relatively constant throughout the year.

The concentrate production target (annual throughput) is a user input. Hourly concentrate deposits into the CSBs are equal to:

$$\frac{\text{Concentrate Production Target [swt]}}{365[\text{days}] \times 24 \left[\frac{\text{hours}}{\text{day}} \right]}$$

CSB levels are increased by this amount every hour.

There are two Teck Cominco sheds - one contains both zinc and lead concentrates, the other contains only zinc – these are modeled as two zinc sheds and one lead shed. In addition, an allowance has been made in the model for a third party CSB. As discussed in Section 3.2.2, one of the conditions that can cause loading delays and increase ship queue time is an empty CSB. Therefore, the third party CSB has been given an infinite size so the shed will never be emptied.

3.2.2 Shed Sizes and Initial Conditions

The minimum combined zinc and lead storage capacity for the CSBs required to ensure the terminal target throughput is achieved, is based on the following formula:

$$\left(1 - \frac{\text{Shipping Season Length [days]}}{365[\text{days}]} \right) \times \text{Concentrate Production Target [swt]}$$

Since the length of shipping season varies, a CSB storage capacity equivalent to 75% of the combined zinc and lead throughputs was used. This equates to total combined CSB storage capacities of 1,158,000 swt and 1,296,750 for throughputs of 1,544,000 tpy and 1,729,000 tpy, respectively.

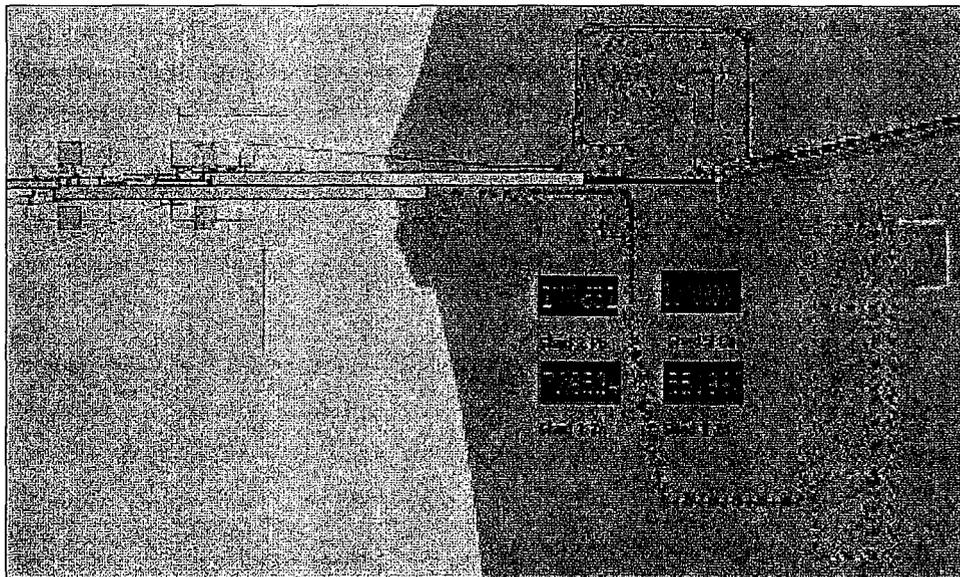
All CSB capacities are reset and filled at the start of each shipping year (July 1), which ensures mine deliveries and CSB sizes do not negatively impact terminal throughput and ship queues.

This approach reflects anticipated terminal operations in that mine deliveries are most critical towards the end of the summer months, when the CSBs have emptied and arriving vessels are typically waiting for mine production. At this time of year, truck deliveries from the mine

are constant, so the constant hourly CSB level increase is a good approximation of actual concentrate deliveries.

Figure 1 shows how the simulation model displays typical CSB levels during the year.

Figure 1 – CSB Level Simulation Display



Variations in mine deliveries outside of the shipping window have little impact on the terminal, as long as the CSBs are full at the start of the shipping season. CSBs will be full at the start of the shipping season as long as mine production remains constant in the non-shipping season, which is the current practice. Excess mine production left over from the previous shipping season is not considered in the simulation. However, estimates of the system's capability to handle excess production can be made by examining average spare terminal capacity captured in the simulation output.

3.3 Model Logic - Offshore

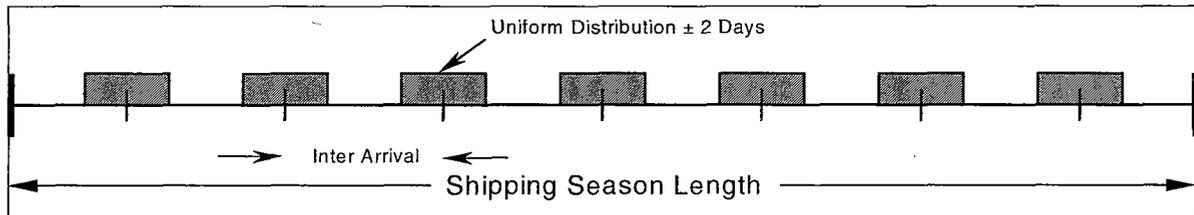
3.3.1 Ship Schedule

Compared to other model logic, the selected ship schedule logic will have the largest impact on ship queue times.

Ship Arrival Pattern

The model schedules ships using a random uniform distribution of ship arrivals centered on a series of constant inter-arrival times. Pictorially, the arrival pattern looks as shown in Figure 2.

Figure 2 - Diagram of Ship Arrival Schedule



Each hashed region represents a ship arriving at the terminal (uniform distribution ± 2 days). This arrival pattern mimics ship scheduling anticipated at the DMT terminal for the shipping season. No ship rescheduling is performed once this schedule has been set.

The schedule currently used in the model was chosen to reflect an ideal arrival pattern.

Shipping Season Length

The shipping season length for the simulation model is based on historical start and end dates from the Teck Cominco 1991-1999 port operating records and ice coverage records in the Chukchi Sea and the Bering Strait for each year from 1961 to 2001. Comparison of these two records indicated that the beginning of the shipping season occurs when the ice concentration is 0/10th while an ice concentration of 2/10th corresponds with the end of the shipping season.

Season start and end dates for the years 1985 to 2000 were input into the simulation model based on the season start and end ice concentrations mentioned above and the following rules:

- 1) In years where 0/10th ice concentration occurs earlier than July 4th, the start of season is set at July 4th. This is the earliest start date since 1991, and makes allowance for potential subsistence issues.
- 2) In years where 0/10th ice concentration occurs between July 4th and 12th, the start of the season is set at that date plus 3 days. This calibrates well with the 1991-1999 records and conceptually provides some time for the off-loading general cargo prior to the start of ship loading operations.
- 3) In years where 0/10th concentration occurs after July 12th, the start of the season is set at July 15th, the latest date experienced thus far. It is believed that the ice observed by

satellite after July 15th is most likely isolated, and the assumption is that the tugs and ships can make their way around it.

- 4) If a 2/10th ice concentration occurs in November, the season is stopped one day before the ice concentration is observed.

In the model, ships start arriving at the terminal shortly after the first day of the shipping season, when the ice clears and the shipping season opens. Specifically, the first ship will arrive at the following date:

$$\text{Season Start Date} + 0.5 \times \text{Ship Inter Arrival Time [days]} \pm 2 \text{ [days]}$$

For example, if 10 ships are expected over a 100 day shipping window, then the inter arrival time of the ships is 10 days. The first ship would arrive on the Start Date + 5 days ± 2 days with the following ship arriving 10 days later ± 2 days after, etc.

Vessel Type and Number of Vessels

The ship schedule logic generates enough ships to ensure that there is sufficient ship capacity to accommodate the target throughput tonnage. At the beginning of each shipping season, the model will randomly calculate the number of Panamax and Handy Size vessels needed to ship the target throughput based on the vessel mix in the input plus two additional ships. For example, if a ship mix of 20 Panamax and 6 Handy Size ships are input into the model, as each ship arrives there is a 77% chance (20/26) that the vessel will be a Panamax and a 23% chance (6/26) that it will be a Handy Size ship. Additional ships are added to account for lost ship capacity resulting from partially loaded vessels leaving the terminal due to poor weather, if the user selects this option. In our model runs, if ships are forced to leave the berth partially loaded because of bad weather, all ships wait offshore until the bad weather subsides and then reberths to complete its loading. Therefore, all ships leave the terminal fully loaded so the two additional ships generated are ignored by the model and not counted in the overall vessel mix.

The vessel mix used for the simulation runs is shown in Table 1.

Table 1 – Vessel Mix

	1,544,000 tpy			1,729,000 tpy		
	Panamax	Handy Size	Tanker	Panamax	Handy Size	Tanker
53 ft Dredged Channel	20	6	4	23	6	4
50 ft Dredged Channel	22	6	4	25	6	4
47 ft Dredged Channel	25	5	4	28	6	4

Once a ship is serviced and leaves, the next ship, if one is available, is allowed to approach the berth.

3.3.2 Ship Type and Size

There are 3 ship types used in the DMT scenarios:

- Panamax bulk carrier
- Handymax bulk carrier
- Fuel tanker

Ship sizes are a user input and Table 2 shows the ship sizes used for the DMT scenarios.

Table 2 – Ship Types

	Panamax	Handy Size	Tanker
53 ft Dredged Channel	65,800 SWT	39,800 SWT	12,000,000 US gal
50 ft Dredged Channel	60,000 SWT	39,800 SWT	12,000,000 US gal
47 ft Dredged Channel	54,300 SWT	39,800 SWT	12,000,000 US gal

Fuel tankers arriving at the terminal are given priority in the anchorage queue (i.e., arriving tankers are placed at the front of the queue). Once the berth is free, tankers are modeled simply by blocking the use of the berth for concentrate.

3.3.3 Loading Rates/Loading Duration

The nominal reclaim and shiploading rate is 2500 t/h. This rate, multiplied by the system availability yields the average reclaim and shiploading rate – a derived rate that incorporates all delays and downtime for the system.

The system availability is a mathematical approximation of the combined reliability of the shiploading and reclaim system. It estimates the overall percentage of time that the shiploading and reclaim system will be ready to load when required. The availability is calculated by multiplying the individual availability of each piece of equipment in the series that comprises the shiploading and reclaim system. Conveyors are typically 98% reliable, while more complex equipment such as shiploaders have a typically reliability of 95%.

In this case, shiploading system availability is estimated as follows:

$$\text{Shiploading system availability} = 83\% (0.95 \times 0.98^4 \times 0.95)$$

Therefore, the average reclaim and shiploading rate used when loading a ship is 2080 t/h (83% of 2500 t/h). This rate is considered constant, and not given a statistical distribution. A distribution would not produce significantly different model results due to the number of times the distribution would be sampled (20 – 30 times per vessel), the net result of which would be the average. For the simulation model, a shiploading rate of 2,100 t/h was used.

The shiploading duration is then the ship tonnage divided by the rate plus any weather delays. Towards the end of season, the vessel loading duration is dictated by shed capacity and mining rate, as the ships are typically waiting for production from the mine.

3.3.4 Capturing Ship Queue Time and Ship Activity

Ships arriving at the terminal will be called to approach the berth once the berth is available. All ships called to the terminal incur the following approach delays:

- Ship travel to berth = 0.5 hours
- Ship turn and berth = 0.5 hours
- Ship documentation and loading preparation = 1.0 hours

Loading commences once these delays have occurred. The difference between the time the ship arrives at the terminal, and the time the vessel starts to load is tracked as the ship queue time for each vessel. The model does not calculate demurrage time.¹

The ships are loaded with concentrate until they are full, or until bad weather conditions force them to cease loading. During loading, only weather conditions, no concentrate delays and hatch changes impede loading. Hatch change delays have been set to 20 minutes per vessel to allow for brief stoppages when switching between the two shiploaders.

Upon completion of loading, all vessels incur the following departure delays:

- Ship final trimming = 1.5 hours
- Ship documentation and survey = 1.0 hours
- Ship de berth = 0.5 hours
- Ship depart channel = 1.0 hours

The time from start loading to stop loading is tracked as the vessel loading time (i.e., documentation and departure delays are not included in the loading time numbers).

¹ The queue time calculated by the model is slightly different than the time typically used in demurrage calculations for terminal operators. Demurrage calculations are typically based upon the amount of time the ship is required to wait to load after the scheduled arrival date, i.e., if a ship arrives early, no demurrage will be accrued until its scheduled arrival time has come and gone. Since demurrage calculations vary from port to port, this calculation was not included in the model.

Once a vessel has cleared the departure channel, the next ship at anchor is called to approach the berth.

3.3.5 Vessel Loading Rules

The model reads in wind, wave, current and water level data on an hourly basis from 16 years of data from 1985 through 2000. Two sets of data were provided to us – one from the US Army Corps of Engineers (COE) and one from Triton Consultants Inc. We ran all scenarios using both sets of data.

Currently, all ships calling on the DMT port in the model adhere to the following rules, where wind speeds refer to average hourly wind speeds and waves refer to significant wave height.

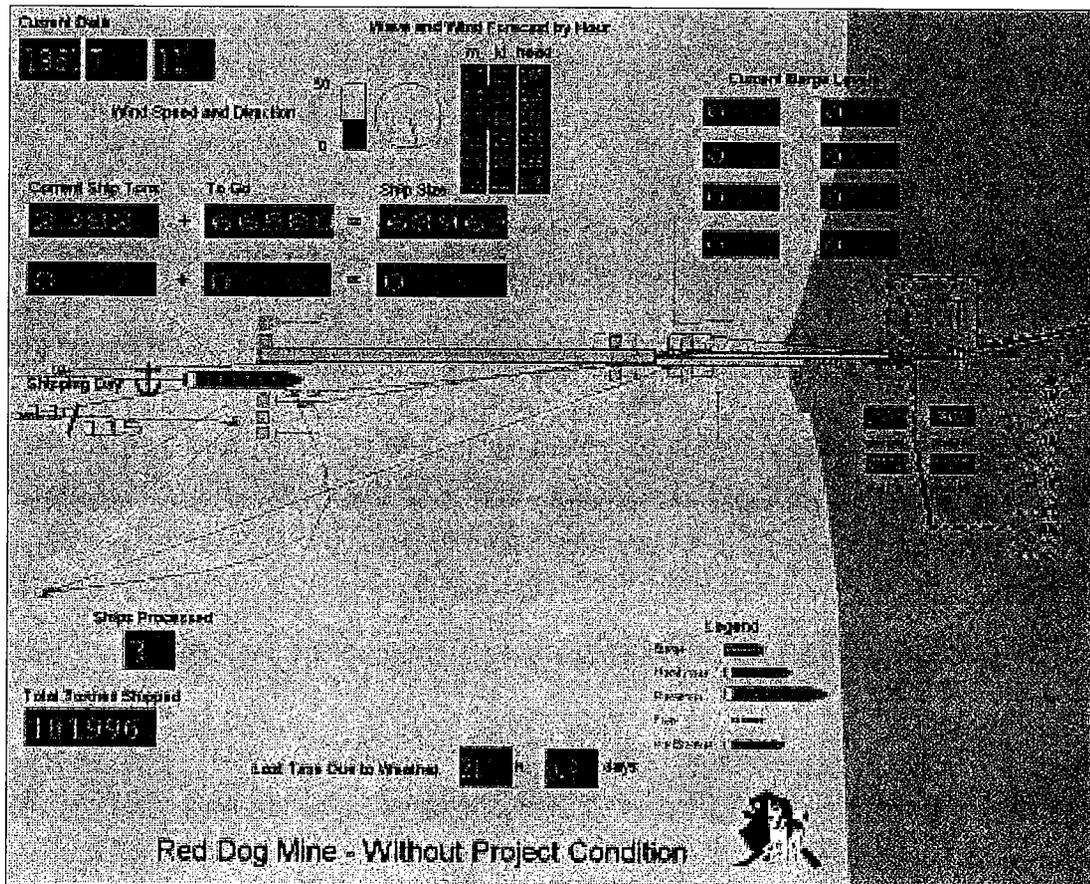
1. Ships will not approach the berth if the present conditions are any one of the following:
 - Wind is equal to or greater than 25 knots
 - Current is equal to or greater than 1 knot
 - Waves are equal to or greater than 6.6 feet (2 m)
2. Ships will not approach the berth if any one of the following conditions will occur in the next 6 hours:
 - Wind is equal to or greater than 35 knots
 - Current equal to or greater than 1 knot
 - Waves are equal to or greater than 6.6 feet (2 m)
3. Stop loading ships if wind is equal to or greater than 30 knots. The ship will wait until conditions are better before re-commencing loading.
4. Ships will leave the berth if any of the following conditions are met:
 - Wind is => 35 knots
 - Current => 1 knot
 - Waves => 6.6 feet (2 m)

If a ship prematurely leaves the berth due to weather conditions, it must check its draft to determine if it can return (this check is a user input as a % of draft). If it can return, the ship waits until the storm is over and then returns to the berth; otherwise the ship leaves partially loaded. For our runs, we have entered 100%, i.e., ships must return to the berth and be fully loaded before they leave the system.

5. If weather conditions permit, vessels will approach the berth, incur approach delays and commence loading. Vessels load at an average rate 2100 t/h. See Section 3.3.3 for details.
6. Vessels that have commenced loading will wait for a full load before departing the berth, unless weather conditions force them to depart.
7. Upon completion of loading, vessels are delayed for a total of 4.0 hours to account for documentation, survey, channel departure, etc. See Section 3.3.4 for details.

Figure 3 shows a screen shot of the simulation model with a vessel loading at the shiploader berth.

Figure 3 - Vessel Loading at Shiploader Berth



3.4 Primary Model Inputs

For each With Project Deep Water Port scenario, input information is entered into a spreadsheet that generates an input file to be read by the simulation model. The user input information includes the throughput goals, ship mix and capacities, mining rates, shiploading

rates, shiploading rules and shiploading delays. See Appendix A for all the Deep Water Port scenarios input sheets.

3.5 Primary Model Result/Output

The primary model outputs from the model are:

- Average number of Panamax vessels visiting the port
- Average number of Handy Size vessels visiting the port
- Shipping Season start date
- Shipping Season finish date
- Gap days between vessels
- Weather excluded days between vessels
- Weather Delays to vessels in port
- Average days in port
- Average Queue time in port
- Gross loading rate for Handy Size
- Gross loading rate for Panamax

The ship queue time is the primary output that is being used by the COE in their economic evaluation. Differences in ship queue time between terminals translate into differences in ship economic cost and terminal operating costs.

Shortfalls or gains in annual terminal throughput targets also translate into shortfalls or gains in revenue, but are currently not used in the COE's economic evaluation.

Appendix B shows a summary of the output results for each scenario.

4.0 WITHOUT PROJECT CONDITION (WPC) AND WITH PROJECT BARGE SCENARIOS

4.1 Model Description

The following scenarios were simulated for the With Project Barge cases and WPC:

- With Project - Breakwater Case:
 - Two and three barge scenarios with terminal throughputs of 1,544,000 tpy and 1,729,000 tpy
- With Project - Additional Barges to Existing Terminal Case:
 - Three barge scenarios with terminal throughputs of 1,544,000 tpy and 1,729,000 tpy
- Without Project Condition
 - Throughputs of 1,544,000 tpy and 1,729,000 tpy

The model input for the With Project Barge cases and WPC is similar to the DMT model input with the main difference being the operating logic surrounding barge movements. Mine production rates (Section 3.2.1), shed sizes and initial conditions (Section 3.2.2), and ship schedule logic (Section 3.3.1) are the same in both simulations.

Differences between onshore operations are described below, along with a detailed description of the barge operations and offshore model logic.

4.2 Model Logic - Onshore

4.2.1 Loading Rates

Historical data was used to determine the loading rate for the WPC case. Based on 1999 figures, an average reclaim and barge-loading rate of 1660 swt/h (1,509 wmt/h) was achieved. This was considered a reasonable, sustainable rate and was incorporated into the model.

A transshipment rate of 1870 swt/h (1700 wmt/h) was extracted from 1999 figures and is used as the average transfer rate from barge to deep-sea vessel.

As with the DMT case, average rates are used for loading.

4.3 Model Logic - Offshore

4.3.1 Vessel Type, Size of Vessels and Number of Vessels

The ship schedule logic generates enough ships to ensure that there is sufficient ship capacity to accommodate the target throughput tonnage as explained in Section 3.3.1.

Table 3 summarizes the vessel mixes used for the breakwater water scenarios, additional barges to existing terminal scenarios and the WPC scenarios.

Table 3 – Vessel Mix

	1,544,000 tpy			1,729,000 tpy		
	Panamax	Handy Size	Fuel Barges	Panamax	Handy Size	Fuel Barges
WPC	20	6	6	23	6	7
Barges Added To WPC	20	6	6	23	6	7
Breakwater Cases	20	6	6	23	6	7

The scenarios use 3 ship types:

- Panamax bulk carrier
- Handymax bulk carrier
- Fuel barge

Ship sizes are a user input and Table 4 shows the ship sizes used for the different scenarios:

Table 4 – Ship Types

	Panamax	Handy Size	Fuel Barge
WPC	65,800 SWT	39,800 SWT	4,000,000 US gal
Barges Added To WPC	65,800 SWT	39,800 SWT	4,000,000 US gal
Breakwater Cases	65,800 SWT	39,800 SWT	4,000,000 US gal

Fuel barges arriving at the terminal are given priority in the anchorage queue (i.e. arriving barges are placed at the front of the queue). Once the berth is free, fuel barges are modeled simply by blocking the use of the berth for concentrate.

4.3.2 Capturing Queue Time and Loading Time

Ships arriving at the terminal wait at anchor until a barge is available for transshipment. Once available, ships are “ready to load” one hour after being called from anchor. The difference between the time the ship arrives at anchor, and the time it is called for loading is captured as the ship queue time. As with the With Project cases, the model does not calculate demurrage.

The ships are loaded with concentrate until they are full, or until bad weather conditions force them to cease loading. During loading, only barge transshipment delays can impede loading.

Upon completion of loading, all vessels incur a departure delay of one hour. The time from start loading to stop loading is tracked as the vessel loading time.

4.3.3 Barge Transshipment

Barge transshipment consists of barges shuttling between the barge loaders and the deep-sea vessels. The user sets the number of barges (between 2 and 6) in the fleet and the number of barge loaders (one or two) available.

Historical data of existing operations were analyzed and used to create statistical distributions for various barge movement activities. Barge movement data for 1999 was broken down into the following categories:

- Barge Wait to Dock: time from when the barge is ready to approach the berth to when it arrives at the berth
- Barge Tie Up Time: time to tie the barge to the dock
- Barge Load Delay: time from when the barge is ready to load to when loading commences
- Barge Wait to Depart Dock: time from when loading finishes to when it leaves the dock

The following distributions were derived from the historical data:

- Barge Wait to Dock: Log Normal; Log Mean = 0.186; Log StdDev = 0.0989
- Barge Tie Up Time: $-0.001 + \text{Exponential}$; Mean = 0.0387
- Barge Load Delay: $-0.001 + \text{Weibull}$; Beta = 0.00877; Alpha = 0.34
- Barge Wait to Depart Dock: Log Normal; Log Mean = 0.182; Log StdDev = 0.107

As with the DMT scenarios, the model reads in wind, wave, current and water level data on an hourly basis from the metocean data.

We received two sets of metocean data – one from the COE and one from Triton. The COE data captures years 1985 to 2001. Triton's data captures 1961 to 2001. Both sets of data were used to run the scenarios. (We used Triton's data from 1985 to 2001 so that the results would be comparable to those using COE data.)

All barges transshipping at the terminal in the WPC scenarios and the Additional Barges to Existing Terminal scenarios adhere to the following rules:

1. At the start of loading, barges will perform a 6-hour look ahead to determine if bad weather is coming. If the weather is clear, loading will commence, if bad weather is forecast, loading will not begin.
2. Stop loading barges at barge berth (if loading) or do not commence loading if the present conditions are any one of the following:
 - Wind \geq 30 knots in any direction
 - Offshore wind speed \geq 25 knots
 - Current \geq 1 knot
 - Waves \geq 3.3 feet (Triton data); Waves \geq 1.3 feet (COE data) based on model calibration results (See Section 5).
3. Travel to the vessel anchored offshore.
4. Transship the cargo to the waiting vessel.
5. Stop transshipping if any of the conditions in (2) are met.
6. Return to the barge berth.
7. Incur an 8-hour delay for cleaning when switching to a different concentrate.

There are a maximum number of two barges allowed to transship third user concentrate. There is no limit on the number of barges working on zinc or lead.

For the breakwater scenarios, it was assumed that a breakwater would be installed that would allow barge loading to occur as long as it is possible to load the vessels at the offshore anchorage. Therefore, rule #2 was modified as follows:

Stop loading (if loading) or do not commence loading if the present conditions are any one of the following:

- Wind \geq 30 knots in any direction
- Offshore wind speed \geq 25 knots
- Current \geq 1 knot
- Waves \geq 5 feet (Triton data); Waves \geq 6 feet (COE data). Using these wave criteria will provide us with an operating range for the breakwater.

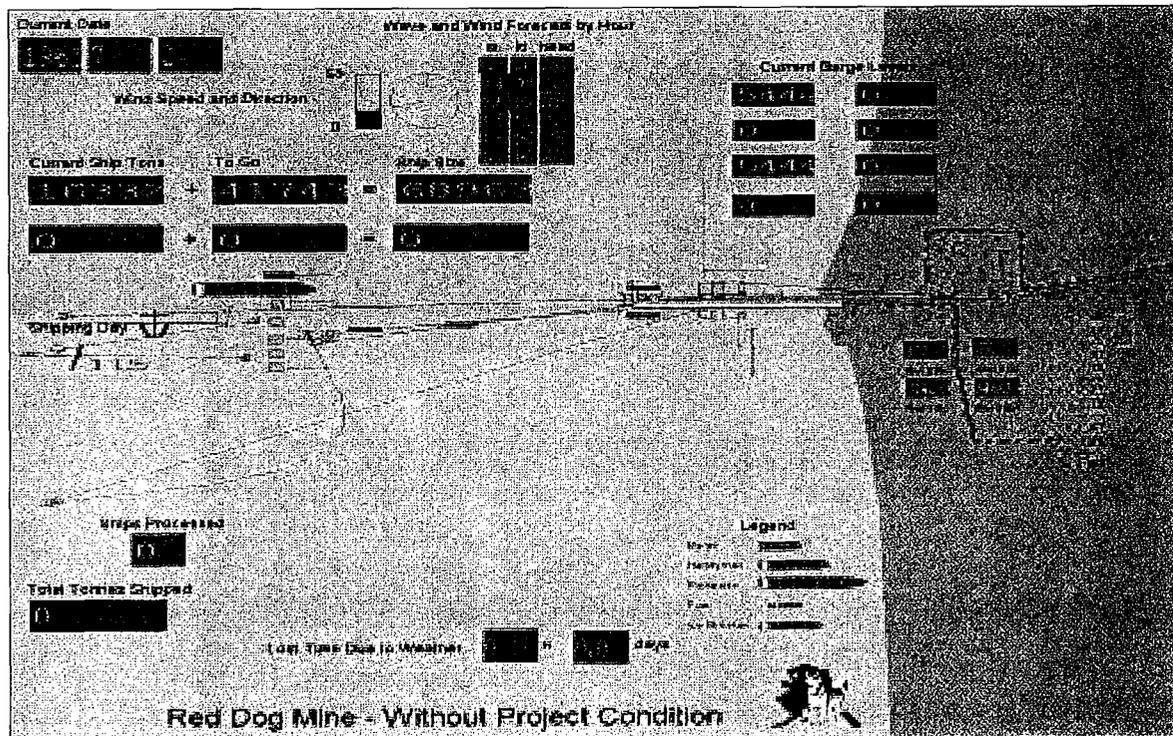
4.3.4 Vessel Loading Rules

Vessel loading rules at the offshore anchorage are dictated by the barge transshipment rules. Thus, transshipping is interrupted only by the conditions described in Section 4.3.3.

Upon completion of transshipment, the vessel is delayed for departure as described in Section 4.3.2

Figure 7 shows the transshipment operation in progress in the simulation model.

Figure 7 - Vessel and Barge Transshipment in Simulation Model



4.4 Primary Model Inputs

As with the With Project Case, input information is entered into a spreadsheet that generates an input file to be read by the simulation model. The user input information includes the throughput goals, ship mix and capacities, mining rates, barge handling rates, barge loading rules, barge stats and fuel barge stats. For all the WPC, With Project – Breakwater case and With Project – Additional Barges to Existing Terminal case scenarios, see Appendix A for all the input sheets.

4.5 Primary Model Result/Output

The primary model outputs from the model are the same as those described in Section 3.5. The ship queue time is the primary output that is being used by the COE in their economic evaluation. Differences in ship queue time between terminals translate into differences in ship economic cost and terminal operating costs.

Shortfalls or gains in annual terminal throughput targets also translate into shortfalls or gains in revenue, but are currently not used in the COE's economic evaluation.

Appendix B shows a summary of the output results for each scenario.

5.0 MODEL CALIBRATION

5.1 Method

The WPC, With Project – Breakwater case and With Project – Additional Barges to Existing Terminal case scenarios were calibrated against historical ship arrival and weather downtime data for 1998 and 1999. The actual ship sizes and arrivals at the port in 1998 and 1999 were used as input into the model. These ships were loaded according to the logic in the model (as described in the previous sections) with the maximum wave height for barge loading varied from 0.1 m to 1.5 m (0.33 feet to 4.9 feet). All other inputs remained constant. Calibration was performed using the COE and Triton meteorological data.

The goal of the exercise was to determine the maximum wave height for barge loading that would cause the ships in the model to experience weather delays approximately the same as those experienced at the terminal in 1998 and 1999. In 1998, the barge loading delays due to poor weather amounted to 13 days; in 1999, they amounted to 17 days.

5.2 Results

For the WPC simulation model, Table 5 shows the results for the calibration exercise using COE and Triton data.

Table 5 - Calibration Data and Results for COE and Triton Data

Calibration Year	Historical Data		COE Data		Triton Data	
	Actual Barge Loading Delays Due to Weather (days)	Maximum Barge Loading Wave Height (m)	Actual Barge Loading Delays Due to Weather (days)	Maximum Barge Loading Wave Height (m)	Actual Barge Loading Delays Due to Weather (days)	
1997	13	0.4	13	1.0	13	
1998	17	0.4	18	1.1	17	

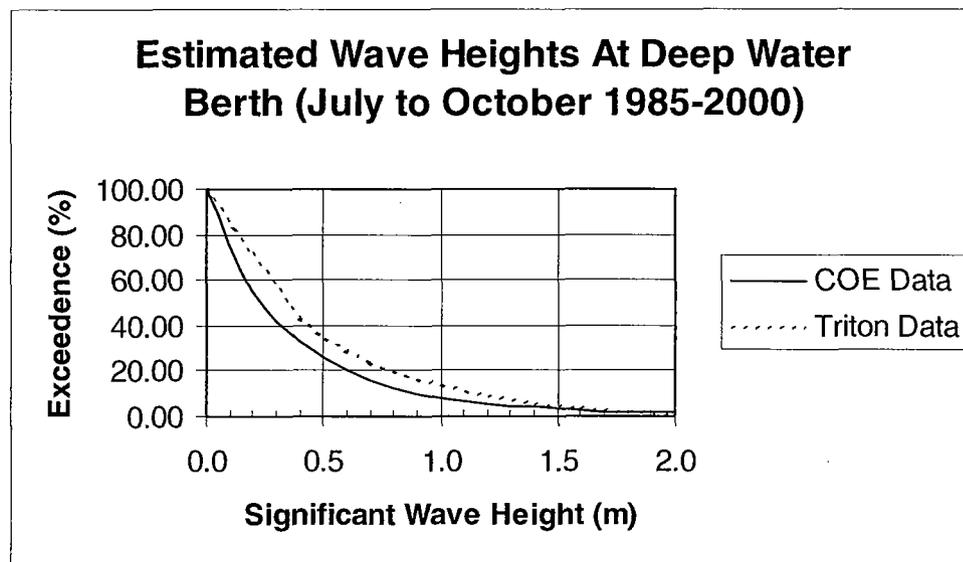
The results show consistency for each set of data between the two years, i.e., to achieve the same amount of weather delay time as observed historically:

- The maximum barge loading wave height using the COE data is 0.4 m using both the 1997 and 1998 data.
- The maximum barge loading wave height using the Triton data is 1.0 to 1.1 using 1997 and 1998 data, respectively.

Thus, these inputs (0.4 m and 1.0 m) for maximum barge loading wave height were used in running the various barge loading scenarios with COE or Triton data, respectively.

No calibration exercise was performed for the With-Project Deep Water Port scenarios, because there is no applicable data for a comparison. For the simulation runs, the same maximum significant wave heights of 2 m were used as operational limits because exceedance curves for both sets of data show they converge around the limiting operational significant wave height of 2 m. Figure 8 shows the exceedance curves for the COE and Triton significant wave height metocean data.

Figure 8 – Exceedance Graph of Estimated Wave Heights at the Deep Water Berth



6.0 ECONOMIC COSTS

6.1 Ship Demurrage

Ship demurrage, resulting from excessive ship wait time, has already been established as an economic cost of terminal operations. The COE uses ship queue times as an input to their economic model to calculate differences in terminal costs between With-Project and WPC.

6.2 Gain and Shortfalls in Annual Throughput Targets

Gains and shortfalls in annual throughput targets fluctuate from year to year primarily due to variations in weather patterns. For this reason, 16 years of weather data are analyzed for each simulation run, with a gain or shortfall reported for each year. The 16 year average is reported as the average gain or shortfall for that terminal configuration.

Gains or shortfalls represent variations in revenue targets and could be considered by the COE as an economic cost of terminal operations.

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Appendix A: Simulation Model Input Data

WPC 1,544,000 TPY (COE Data)

Run Setup	
Run Name	WPC Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 22,357,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

WPC 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals		SWT
Zn Shipping Goal		1,333,000
Pb Shipping Goal		211,000
Cu Shipping Goal		-
Production Goal		1,544,000
Target Shipping Window (days)		90

Handling Rates		WMT/h
Average Barge Loading Rate		1,509
Allow Simultaneous Zn Loading		N
Average Transshipment Rate		1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,644	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 22,357,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth		0.50
Ship Turn and Berth		0.50
Ship Documentation and Load Prep		1.00
Ship Hatch Change		0.05
Ship Warping		-
Ship Final Trimming		1.50
Ship Documentation and Survey		1.00
Ship Deberth		0.50
Ship Depart Channel		1.00
Ship Loading Delays	no	
Hatch Changes		6.00
Warp Movements Per Vessel		-

WPC 1,729,000 TPY (COE Data)

Run Setup	WPC Phase 1a	24
Run Name	24 0655637	
Run Length (YEAR)	24	
Report Interval (hours)		
Start Date	1985	
Month	6	
Day	1	
Terminal Configuration		
Scenario	Whitford Project Condition	
Phase	Phase 1a	
Shipping Goals	SWT	
Zn Shipping Goal	1,492,718	
Pb Shipping Goal	236,282	
Cu Shipping Goal	-	
Production Goal	1,729,000	
Target Shipping Window (days)	90	
Handling Rates	WMT/n	
Average Barge Loading Rate	1,509	
Allow Simultaneous Zn Loading	N	
Average Transshipment Rate	1,700	
Ship Mix	Throughput Shipped	
Feammax	87%	
Hardmax	139%	
Totals	100%	
Average Time Between Arrivals (days)	2.50	
Ship Arrival Method	Fixed	
Barge Stats		
Number Of Barges	2	
Barge Size (WMT)	5,444	
Number of Barge Loaders	1	
Mining	Rate In (SWT/day)	Capacity (SWT)
Shed 1 Zn	2,328	620,421
Shed 2 Zn	1,762	469,439
Shed 2 Pb	647	206,890
Shed 3 Cu	-	-
Totals	4,737	1,296,750
Reset Sheds on July 1?	Yes	
Barge Loading Rules		
Barge Exit Waves (m)	0.4	
Barge Exit Wind (knots)	30	
Barge Exit Wind 2 (knots)	25	
Barge Wind Dir 1 (heading)	180	
Barge Wind Dir 2 (heading)	360	
Fuel Barges		
Fuel Barges per Shipping Season	3,576,290	
Fuel Load (US Gallons)	3,576,290	
Average Fuel Unloading Rate (gpm)	4,000	
Average Fuel Unloading Time (h)	15	
Shiploading	Average Shiploading Rate (swt/h)	2,100
Ship Loading Rules		
Ship Approach Wind (knots)	25.0	
Ship Approach Current (knots)	1.0	
Ship Approach Wind (24 h) (knots)	35.0	
Ship Approach Current (24 h) (knots)	1.0	
Ship Approach Waves (24 h) (m)	2.0	
Ship Stop Loading Wind (knots)	30	
Ship Exit Wind (knots)	35	
Ship Exit Current (knots)	1	
Ship Exit Waves (m)	2	
Ship Re-Approach Draft (% loaded)	100%	
Ship Depart Minimum Water Level (m)	-0.1	
Ship Loading Delays		
Ship Approach Berth	0.50	
Ship Turn and Berth	0.50	
Ship Documentation and Load Prep	1.00	
Ship Hatch Change	0.05	
Ship Waring	-	
Ship Final Trimming	1.50	
Ship Documentation and Survey	1.00	
Ship Deberth	0.50	
Ship Depart Channel	1.00	
Ship Loading Delays	no	
Hatch Changes	6.00	
Warp Movements Per Vessel	-	

Annual Fuel (US Gallons)	25,033,957	
Fuel to 4,000,000 US Gallons		
Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
2,328	620,421	620,421
1,762	469,439	469,439
647	206,890	206,890
4,737	1,296,750	1,296,750
Yes		

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Feammax	87%	597,100	23	79%	1,373,321	1,513,400
Hardmax	139%	35,844	6	21%	216,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400

1. WMT = 1,102 Short Wet Ton

WPC 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	135,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) = 25,033,957

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 3 Barges 1,544,000 TPY (COE Data)

Run Setup	
Run Name	WPC 3 Barges Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1,102 Short Wet Ton

Shipping Goals		SWT
Zn Shipping Goal		1,333,000
Pb Shipping Goal		211,000
Cu Shipping Goal		-
Production Goal		1,544,000
Target Shipping Window (days)		90

Handling Rates		WMT/h
Average Barge Loading Rate		1,509
Allow Simultaneous Zn Loading		N
Average Transshipment Rate		1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Slats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 22,857,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth		0.50
Ship Turn and Berth		0.50
Ship Documentation and Load Prep		1.00
Ship Hatch Change		0.05
Ship Warping		-
Ship Final Trimming		1.50
Ship Documentation and Survey		1.00
Ship Deberth		0.50
Ship Depart Channel		1.00
Ship Loading Delays	no	
Hatch Changes		6.00
Warp Movements Per Vessel		-

With Project – 3 Barges 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	WPC 3 Barges Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 22,357,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 3 Barges 1,729,000 TPY (COE Data)

Run Setup	
Run Name	WPC 3 Barges Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 25,033,957

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 3 Barges 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	WPC 3 Barges Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1988
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir.1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 25,033,957

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – Breakwater - 2 Barges 1,544,000 TPY (COE Data)

Run Setup	
Run Name	WPC Breakwater Phase 1
Run Length: (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.8
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 22,357,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – Breakwater - 2 Barges 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Breakwater Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

1 MWT = 1,102 Short Wet Ton

Shipping Goals	SWT
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	WMT/h
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.5
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) = 22,357,000

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	h
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – Breakwater - 2 Barges 1,729,000 TPY (COE Data)

Run Setup	
Run Name	WPC Breakwater Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

1 MWT = 1,102 Short Weight Ton

Shipping Goals	
SWT	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.8
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 25,033,957

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Up to 4,000,000 US gallons

Shiplading	
Average Shiplading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – Breakwater - 2 Barges 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Breakwater Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	% Without Project Condition
Phase	Phase 1a

Shipping Goals	
SWT	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Fb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.5
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Fuel Barges	
Fuel Barges per Shipping Season	74
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	
no	
Hatch Changes	6.00
Warp Movements Per Vessel	-

MWT: 1,102 Short Wet Ton

Annual Fuel (US Gallons): 25,033,957

Up to 4,000,000 US gallons

With Project – Breakwater - 3 Barges 1,544,000 TPY (COE Data)

Run Setup	
Run Name	WPC Breakwater Phase 1
Run Length: (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Contribution
Phase	Phase 1

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.8
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,167
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Annual Fuel (US Gallons) 22,357,000

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

1 MWT = 1.102 Short Wet Ton

With Project – Breakwater - 3 Barges 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Breakwater Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1

Shipping Goals	
SWT	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.5 m for Triton and 1.8 for COE
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Fuel Barges	
Fuel Barges per Shipping Season	6
Fuel Load (US gallons)	3,726,187
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	16

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	
no	
Hatch Changes	6.00
Warp Movements Per Vessel	-

1 MWT = 1.102 Short Wet Ton

With Project – Breakwater - 3 Barges 1,729,000 TPY (COE Data)

Run Setup	
Run Name	WPC Breakwater Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

Shipping Goals	
SWT	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.8
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15
Annual Fuel (US Gallons)	25,033,957
Up to 4,000,000 US gallons	

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

1 MWT = 1,102 Short Wet Ton

With Project – Breakwater - 3 Barges 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	WPC Breakwater Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Without Project Condition
Phase	Phase 1a

1 MWT = 1.102 Short Wet Ton

Shipping Goals		SWT
Zn Shipping Goal	1,492,718	
Pb Shipping Goal	236,282	
Cu Shipping Goal	-	
Production Goal	1,729,000	
Target Shipping Window (days)	90	

Handling Rates		WMT/h
Average Barge Loading Rate	1,509	
Allow Simultaneous Zn Loading	N	
Average Transshipment Rate	1,700	

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.50					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	3
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.5
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	30
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 25,033,957

Fuel Barges	
Fuel Barges per Shipping Season	7
Fuel Load (US gallons)	3,576,280
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	15

Up to 4,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth	0.50	
Ship Turn and Berth	0.50	
Ship Documentation and Load Prep	1.00	
Ship Hatch Change	0.05	
Ship Warping	-	
Ship Final Trimming	1.50	
Ship Documentation and Survey	1.00	
Ship Deberth	0.50	
Ship Depart Channel	1.00	
Ship Loading Delays	no	
Hatch Changes	6.00	
Warp Movements Per Vessel	-	

With Project – 47 Ft Channel 1,544,000 TPY (COE Data)

Run Setup	
Run Name	DMT 47 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	49,274	25	83%	1,231,851	1,357,500
Handymax	13%	35,844	5	17%	179,220	197,500
Totals	100%	47,595	30	100%	1,411,071	1,555,000
Average Time Between Arrivals (days)	2.65					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 43,831,487

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 47 Ft Channel 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 47 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	88%	49,274	25	83%	1,231,851	1,357,500
Handymax	13%	35,844	5	17%	179,220	197,500
Totals	100%	47,595	30	100%	1,411,071	1,555,000
Average Time Between Arrivals (days)	2.65					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 43,831,487

Fuel Barges	
Fuel Barges per Shipping Season	74
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 47 Ft Channel 1,729,000 TPY (COE Data)

Run Setup	
Run Name	DMT 47 ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

Shipping Goals	
SWT	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	49,274	28	82%	1,379,673	1,520,400
Handymax	13%	35,844	6	18%	215,064	237,000
Totals	100%	47,528	34	100%	1,594,737	1,757,400
Average Time Between Arrivals (days)	2.37					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	11,627,111
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	48

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	
no	
Hatch Changes	6.00
Warp Movements Per Vessel	-

1 MWT = 102 Short Wet Ton

Annual Fuel (US Gallons) 46,508,443

Up to 12,000,000 US gallons

With Project – 47 Ft Channel 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 47 Ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

Shipping Goals		SWT
Zn Shipping Goal	1,492,718	
Pb Shipping Goal	236,282	
Cu Shipping Goal	-	
Production Goal	1,729,000	
Target Shipping Window (days)	90	

Handling Rates		WMT/h
Average Barge Loading Rate	1,509	
Allow Simultaneous Zn Loading	N	
Average Transshipment Rate	1,700	

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	49,274	28	82%	1,379,673	1,520,400
Handymax	13%	35,844	6	18%	215,064	237,000
Totals	100%	47,528	34	100%	1,594,737	1,757,400
Average Time Between Arrivals (days)	2.37					
Ship Arrival Method	Fixed					

Barge Slats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Fuel Barges		Annual Fuel (US Gallons)
Fuel Barges per Shipping Season	4	46,508,443
Fuel Load (US gallons)	11,627,111	Up to 12,000,000 US gallons
Average Fuel Unloading Rate (gpm)	4,000	
Average Fuel Unloading Time (h)	48	

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth	0.50	
Ship Turn and Berth	0.50	
Ship Documentation and Load Prep	1.00	
Ship Hatch Change	0.05	
Ship Warping	-	
Ship Final Trimming	1.50	
Ship Documentation and Survey	1.00	
Ship Deberth	0.50	
Ship Depart Channel	1.00	
Ship Loading Delays	no	
Hatch Changes	6.00	
Warp Movements Per Vessel	-	

1 WMT = 1.02 Short Wet Ton

With Project – 50 Ft Channel 1,544,000 TPY (COE Data)

Run Setup	
Run Name	DMT 50 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	54,446	22	79%	1,197,822	1,320,000
Handymax	15%	35,844	6	21%	215,064	237,000
Totals	100%	51,656	28	100%	1,412,886	1,557,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 12	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 43,831,387

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 50 Ft Channel 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 50 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
	SWT
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
	WMT/h
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	54,446	22	79%	1,197,822	1,320,000
Handymax	15%	35,844	6	21%	215,064	237,000
Totals	100%	51,656	28	100%	1,412,886	1,557,000
Average Time Between Arrivals (days)	2.81					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 43,831,487

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (sw/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
	h
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 50 Ft Channel 1,729,000 TPY (COE Data)

Run Setup	
Run Name	DMT 50 ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

1 MWT = 1,102 Short Wet Ton

Shipping Goals		SWT
Zn Shipping Goal		1,492,718
Pb Shipping Goal		236,282
Cu Shipping Goal		-
Production Goal		1,729,000
Target Shipping Window (days)		90

Handling Rates		WMT/h
Average Barge Loading Rate		1,509
Allow Simultaneous Zn Loading		N
Average Transshipment Rate		1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	54,446	25	81%	1,361,162	1,500,000
Handymax	14%	35,844	6	19%	215,064	237,000
Totals	100%	51,935	31	100%	1,576,225	1,737,000
Average Time Between Arrivals (days)	2.57					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 46,508,443

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	11,627,111
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	48

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swth)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth		0.50
Ship Turn and Berth		0.50
Ship Documentation and Load Prep		1.00
Ship Hatch Change		0.05
Ship Warping		-
Ship Final Trimming		1.50
Ship Documentation and Survey		1.00
Ship Deberth		0.50
Ship Depart Channel		1.00
Ship Loading Delays		no
Hatch Changes		6.00
Warp Movements Per Vessel		-

With Project – 50 Ft Channel 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 50 ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	54,446	25	81%	1,361,162	1,500,000
Handymax	14%	35,844	6	19%	215,064	237,000
Totals	100%	51,935	31	100%	1,576,225	1,737,000
Average Time Between Arrivals (days)	2.57					
Ship Arrival Method	Fixed					

Barge Slats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir. 2 (heading)	360

Annual Fuel (US Gallons) 46,508,443

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	11,627,111
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	48

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 53 Ft Channel 1,544,000 TPY (COE Data)

Run Setup	
Run Name	DMT 53 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 1,102 Short Wet Ton

Shipping Goals	
SWT	
Zn Shipping Goal	1,333,000
Pb Shipping Goal	211,000
Cu Shipping Goal	-
Production Goal	1,544,000
Target Shipping Window (days)	90

Handling Rates	
WMT/h	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	3.00					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) = 43,831,487

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
h	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 53 Ft Channel 1,544,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 53 ft Phase 1
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1

1 MWT = 1.102 Short Wet Ton

Shipping Goals		SWT
Zn Shipping Goal		1,333,000
Pb Shipping Goal		211,000
Cu Shipping Goal		-
Production Goal		1,544,000
Target Shipping Window (days)		90

Handling Rates		WMT/h
Average Barge Loading Rate		1,509
Allow Simultaneous Zn Loading		N
Average Transshipment Rate		1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	85%	59,710	20	77%	1,194,192	1,316,000
Handymax	15%	35,844	6	23%	215,064	237,000
Totals	100%	56,130	26	100%	1,409,256	1,553,000
Average Time Between Arrivals (days)	3.00					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,079	569,125	569,125
Shed 2 Zn	1,573	430,625	430,625
Shed 2 Pb	578	158,250	158,250
Shed 3 Cu	-	-	-
Totals	4,230	1,158,000	1,158,000
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) = 43,831,487

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	10,957,872
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	46

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays		h
Ship Approach Berth		0.50
Ship Turn and Berth		0.50
Ship Documentation and Load Prep		1.00
Ship Hatch Change		0.05
Ship Warping		-
Ship Final Trimming		1.50
Ship Documentation and Survey		1.00
Ship Deberth		0.50
Ship Depart Channel		1.00
Ship Loading Delays	no	-
Hatch Changes		6.00
Warp Movements Per Vessel		-

With Project – 53 Ft Channel 1,729,000 TPY (COE Data)

Run Setup	
Run Name	DMT 53 ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

1 MWT = 1.102 Short Wet Ton

Shipping Goals	
	SWT
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
	WMT/h
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.73					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	0.4
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir. 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons) 46,508,443

Fuel Barges	
Fuel Barges per Shipping Season	4
Fuel Load (US gallons)	11,627,111
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	48

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
	h
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

With Project – 53 Ft Channel 1,729,000 TPY (Triton Data)

Run Setup	
Run Name	DMT 53 ft Phase 1a
Run Length (YEAR)	24.06556317
Report Interval (hours)	24

Start Date	
Year	1985
Month	6
Day	1

Terminal Configuration	
Scenario	Delong Mountain Terminal
Phase	Phase 1a

1 MWT = 1.02 Short Wet Ton

Shipping Goals	
Zn Shipping Goal	1,492,718
Pb Shipping Goal	236,282
Cu Shipping Goal	-
Production Goal	1,729,000
Target Shipping Window (days)	90

Handling Rates	
Average Barge Loading Rate	1,509
Allow Simultaneous Zn Loading	N
Average Transshipment Rate	1,700

Ship Mix	Throughput Shipped	Average Ship Size (WMT)	No. of Calls	% Calls	Expected Throughput (WMT)	Expected Throughput (SWT)
Panamax	87%	59,710	23	79%	1,373,321	1,513,400
Handymax	13%	35,844	6	21%	215,064	237,000
Totals	100%	56,607	29	100%	1,588,385	1,750,400
Average Time Between Arrivals (days)	2.73					
Ship Arrival Method	Fixed					

Barge Stats	
Number Of Barges	2
Barge Size (WMT)	5,444
Number of Barge Loaders	1

Mining	Rate In (SWT/day)	Capacity (SWT)	Initial Level (SWT)
Shed 1 Zn	2,328	620,421	620,421
Shed 2 Zn	1,762	469,439	469,439
Shed 2 Pb	647	206,890	206,890
Shed 3 Cu	-	-	-
Totals	4,737	1,296,750	1,296,750
Reset Sheds on July 1?	Yes		

Barge Loading Rules	
Barge Exit Waves (m)	1.0
Barge Exit Wind (knots)	30
Barge Exit Wind 2 (knots)	25
Barge Wind Dir 1 (heading)	180
Barge Wind Dir 2 (heading)	360

Annual Fuel (US Gallons): 46,508,443

Fuel Barges	
Fuel Barges per Shipping Season	14
Fuel Load (US gallons)	11,627,111
Average Fuel Unloading Rate (gpm)	4,000
Average Fuel Unloading Time (h)	48

Up to 12,000,000 US gallons

Shiploading	
Average Shiploading Rate (swt/h)	2,100

Ship Loading Rules	
Ship Approach Wind (knots)	25.0
Ship Approach Current (knots)	1.0
Ship Approach Waves (m)	2.0
Ship Approach Wind (24 h) (knots)	35.0
Ship Approach Current (24 h) (knots)	1.0
Ship Approach Waves (24 h) (m)	2.0
Ship Stop Loading Wind (knots)	30
Ship Exit Wind (knots)	35
Ship Exit Current (knots)	1
Ship Exit Waves (m)	2
Ship Re-Approach Draft (% loaded)	100%
Ship Depart Minimum Water Level (m)	-0.1

Ship Loading Delays	
Ship Approach Berth	0.50
Ship Turn and Berth	0.50
Ship Documentation and Load Prep	1.00
Ship Hatch Change	0.05
Ship Warping	-
Ship Final Trimming	1.50
Ship Documentation and Survey	1.00
Ship Deberth	0.50
Ship Depart Channel	1.00
Ship Loading Delays	no
Hatch Changes	6.00
Warp Movements Per Vessel	-

Appendix B: Summary of Simulation Runs

Summary of Simulation Runs Using COE Data

Run Name	WMT	SWT	No. of Vessels	Panamax	Handymax	Start	Finish	Total Days (Start to Finish)	Gaps Between Vessels	Weather Excluded Days Between Vessels	Weather Delays to Vessels in Port	Average Days in Port	Average Queue Time in Port	Gross Loading Rate Handymax	Gross Loading Rate Panamax
Without Project	Maximum Wave Height: 0.4 m														
Without Project 1,544,000 tpy	1,379,781	1,520,519	25	19.8	5.6	11-Jul	23-Oct	104	11	2	37	15.9	12.3	937.3	842.2
Without Project 1,729,000 tpy	1,477,908	1,628,654	27	21.6	5.2	11-Jul	25-Oct	107	8	2	38	20.1	16.5	951.3	842.1
With Project - 3 Barges	Maximum Wave Height: 0.4 m														
With Project - 3 Barges 1,544,000 tpy	1,425,285	1,570,664	26	20.6	5.4	11-Jul	19-Oct	100	18	5	34	10.9	7.7	1,183.4	1,057.0
With Project - 3 Barges 1,729,000 tpy	1,567,504	1,727,389	28	22.9	5.6	11-Jul	20-Oct	102	14	3	36	13.9	10.9	1,225.4	1,057.7
With Project - Breakwater	Maximum Wave Height: 1.8 m														
2 Barges - 1544000 tpy	1,429,854	1,575,700	27	20.1	6.4	11-Jul	20-Oct	101	23	1	4	5.1	2.0	1,031.6	969.9
2 Barges - 1729000 tpy	1,596,648	1,759,506	29	23.3	5.7	11-Jul	18-Oct	99	17	1	4	6.0	3.0	1,033.1	976.3
3 Barges - 1544000 tpy	1,429,735	1,575,569	26	20.1	6.3	11-Jul	16-Oct	97	36	1	3	3.9	1.3	1,292.7	1,245.8
3 Barges - 1729000 tpy	1,595,739	1,758,504	31	20.8	9.8	11-Jul	13-Oct	94	32	1	3	3.9	1.5	1,327.8	1,245.0
With Project - DMT Shiploader	Maximum Wave Height: 2.0 m														
DMT - 47 ft Channel Run 1,544,000 swtpy	1,426,197	1,571,669	31	24.6	5.9	11-Jul	18-Oct	100	47	6	7	3.0	1.0	1,564.6	1,603.9
DMT - 47 ft Channel Run 1,729,000 swtpy	1,593,238	1,755,749	34	28.5	5.3	11-Jul	17-Oct	99	45	5	7	2.8	1.0	1,629.7	1,603.6
DMT - 50 ft Channel Run 1,544,000 swtpy	1,428,511	1,574,219	28	21.9	6.6	11-Jul	20-Oct	101	48	5	8	3.0	0.9	1,635.0	1,590.8
DMT - 50 ft Channel Run 1,729,000 swtpy	1,593,816	1,756,385	31	25.0	6.4	11-Jul	18-Oct	99	45	5	7	2.9	0.9	1,625.8	1,611.0
DMT - 53 ft Channel Run 1,544,000 swtpy	1,428,165	1,573,838	26	20.3	6.0	11-Jul	19-Oct	100	46	5	8	3.3	1.0	1,592.3	1,598.3
DMT - 53 ft Channel Run 1,729,000 swtpy	1,599,081	1,762,187	29	23.2	5.9	11-Jul	19-Oct	100	43	5	7	3.2	1.0	1,589.0	1,609.5

Summary of Simulation Runs Using Triton Data

Run Name	WMT	SWT	No. of Vessels	Panamax	Handymax	Start	Finish	Total Days (Start to Finish)	Gaps Between Vessels	Weather Excluded Days Between Vessels	Weather Delays to Vessels in Port	Average Days in Port	Average Queue Time in Port	Gross Loading Rate Handymax	Gross Loading Rate Panamax
Without Project	Maximum Wave Height: 1.0 m														
Without Project 1,544,000 tpy	1,432,693	1,578,718	26	20.3	6.1	11-Jul	21-Oct	101	14	2	18	9.5	6.1	948.1	850.8
Without Project 1,729,000 tpy	1,594,727	1,757,389	29	23.3	5.7	11-Jul	19-Oct	100	15	2	19	13.2	10.1	976.7	889.1
With Project - 3 Barges	Maximum Wave Height: 1.0 m														
With Project - 3 Barges 1,544,000 tpy	1,430,085	1,575,954	26	20.4	5.8	11-Jul	16-Oct	97	23	3	18	6.0	3.0	1,205.5	1,051.7
With Project - 3 Barges 1,729,000 tpy	1,599,382	1,762,519	29	23.1	6.1	11-Jul	16-Oct	97	19	3	18	7.6	4.7	1,193.7	1,076.5
With Project - Breakwater	Maximum Wave Height: 1.5 m														
2 Barges - 1544000 tpy	1,430,518	1,576,431	26	20.4	5.9	11-Jul	20-Oct	101	17	2	11	6.3	3.0	989.9	910.0
2 Barges - 1729000 tpy	1,597,648	1,760,608	29	23.2	6.0	11-Jul	19-Oct	100	15	2	12	8.6	5.5	998.7	927.7
3 Barges - 1544000 tpy	1,428,837	1,574,579	27	19.9	6.6	11-Jul	15-Oct	97	31	3	10	4.4	1.6	1,259.9	1,141.9
3 Barges - 1729000 tpy	1,597,724	1,760,692	29	23.3	5.7	11-Jul	16-Oct	97	24	3	11	5.3	2.6	1,279.7	1,136.5
With Project - DMT Shiploader	Maximum Wave Height: 2.0 m														
DMT - 47 ft Channel Run 1,544,000 swtpy	1,423,208	1,568,375	30	24.3	5.6	10-Jul	17-Oct	99	45	6	11	3.1	1.1	1,551.0	1,536.6
DMT - 47 ft Channel Run 1,729,000 swtpy	1,597,639	1,760,488	34	27.9	6.3	11-Jul	18-Oct	100	43	6	10	3.0	1.1	1,521.7	1,560.4
DMT - 50 ft Channel Run 1,544,000 swtpy	1,431,034	1,577,000	28	22.3	6.0	11-Jul	20-Oct	101	45	7	11	3.2	1.0	1,551.5	1,535.5
DMT - 50 ft Channel Run 1,729,000 swtpy	1,592,105	1,754,500	31	25.3	6.0	11-Jul	17-Oct	98	43	6	10	3.0	1.0	1,523.0	1,566.5
DMT - 53 ft Channel Run 1,544,000 swtpy	1,431,639	1,577,667	26	20.6	5.6	11-Jul	20-Oct	101	43	6	12	3.5	1.1	1,525.2	1,525.0
DMT - 53 ft Channel Run 1,729,000 swtpy	1,599,079	1,762,185	29	23.3	5.8	11-Jul	19-Oct	100	40	6	11	3.4	1.1	1,570.1	1,641.4

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