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**New Cargo Export Project – Vessel Cargoes**


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**1 Summary**

The following sections of this document provide information on the calculation used to estimate the increase of between 7 and 19 vessels per year calling at Westshore based on Westshore handling 4.5 mtpa of potash in addition to coal, with total combined potash and coal terminal capacity at 36 mtpa.

The calculations also show the variation in the existing number of coal vessels of  $\pm 13\%$  or 50 vessels per year (based on five-year data), resulting from average coal vessel cargo size variation (e.g., smaller or larger average vessels that are chartered to ship the coal).

The predicted increase of 7 to 19 additional vessels, when compared to the existing variation of the number of coal vessels is relatively insignificant.

**2 Vessel Calculations**

The proposed New Cargo Export Project at the Westshore Terminal Limited Partnership (Westshore) site is designed to have a capacity of up to 4.5 mtpa of potash. Based on the information provided by BHP on the breakdown of estimated vessel cargoes (see Figure 1 – Number of Vessel Calculation) this results in 4.5 mtpa of potash being shipped annually in approximately 74 vessels with an average cargo size of 60,810 tonnes.

Terminal Throughput 4,500,000 tonnes						
Vessel Category	Min. (tonnes)	Max. (tonnes)	%	Median (Tonnes)	Total Tonnes	Vessel Count
Handysize	10,000	39,999	5%	25,000	225,000	9.0
Handymax	40,000	49,999	7%	45,000	315,000	7.0
Supramax	50,000	59,999	23%	55,000	1,035,000	18.8
Ultramax	60,000	64,999	17%	62,500	765,000	12.2
Panamax	65,000	79,999	20%	72,500	900,000	12.4
Kamsarmax	80,000	89,999	25%	85,000	1,125,000	13.2
Post Panamax	90,000	120,000	3%	105,000	135,000	1.3
Totals			100%	60,810	4,500,000	74.0

Figure 1 – Number of Potash Vessels Calculation

Westshore has assumed conservatively that the volume of potash shipped per year will offset coal on a one-to-one basis resulting in a reduction in the possible coal throughput of 4.5 mtpa. Figure 2 – Average Coal Cargoes provides data on average Berth 2 cargoes between 2016 and 2020. Over this period the

average cargo size on Berth 2 ranged from 76,714 tonnes (2020) to 94,539 tonnes (2017) with an average over the five years of 82,033 tonnes.

Berth Throughput and Average Vessel Size									
Vessel Category	Berth 2 (Tonnes)	Berth 2 Vessels	Berth 2 Average Tonnes	Berth 1 (Tonnes)	Berth 1 Vessels	Berth 1 Average Tonnage	Berth 1 & 2 (Tonnes)	Berth 1 & 2 Vessels	Average Tonnage
2021 to YTD	11,151,644	148	75,349	14,786,058	117	126,377	25,937,702	265	97,878
2020	13,578,360	177	76,714	16,091,383	110	146,285	29,669,743	287	103,379
2019	14,542,618	191	76,139	16,601,091	171	97,082	31,143,709	362	86,032
2018	15,278,471	187	81,703	15,325,404	152	100,825	30,603,875	339	90,277
2017	14,369,927	152	94,539	14,802,656	135	109,649	29,172,583	287	101,647
2016	12,455,839	137	91,919	13,481,863	97	138,988	25,937,702	234	110,845
Totals	81,376,859	992	82,033	91,088,455	782	116,481.4	172,465,314	1,774	97,218.3

Figure 2 – Average Coal Cargoes

### 3 Vessel Average Cargo Size Effects

A review of the average tonnage column in Figure 2 above clearly shows that average coal vessel sizes have varied by  $\pm 12\%$  over the last five years. This variation in vessel size is typically driven by demand variation in markets that has a knock-on effect due to limitations in the respective ports, metallurgical versus thermal throughputs and cost of vessel chartering.

In Westshore's highest throughput year, 2019, Westshore shipped 31.1 mtpa of which 16.60 mtpa was loaded at Berth 1 onto 171 vessels and 14.52 mtpa was loaded at Berth 2 onto 191 vessels for a total of 362 vessels loaded. Using the data in Figure 2 and picking the highest and lowest annual average cargo sizes and an annual throughput of 31.03 mtpa (Westshore's current max. shipped capacity) the variation in Figure 3 – 31.1 Terminal mtpa Vessel Size Variation Effects can be calculated. As can be seen from the data provided if the terminal tonnage is kept the same and the number of vessels is calculated using historical data from the last five years a variation of 106 vessels is possible based solely on whether the minimum or maximum average vessel cargo statistics are used.

31.1 mtpa Terminal mtpa Vessel Size Variation Effects								
Vessel Category	Berth 2 (Tonnes)	Average Vessel Size (Tonnes)	Berth 2 Vessels	Berth 1 (Tonnes)	Average Vessel Size (Tonnes)	Berth 1 Vessels	Berth 1 & 2 (Tonnes)	Berth 1 & 2 Vessels
2019 (Min. Vessel Size)	14,542,618	76,139	191	16,601,091	97,082	171	31,143,709	362
Average Vessel Sizes	14,542,618	82,033	177	16,601,091	116,481	143	31,143,709	320
2016 (Max. Vessel Size)	14,542,618	90,919	137	16,601,091	138,988	119	31,143,709	256
Delta (Max - Min)								106

Figure 3 – 31.1 Terminal mtpa Vessel Size Variation Effects (Coal)

If we assume that the ratio of throughput between Berth 1 and Berth 2 remains the same, increase the terminal coal capacity to the design capacity of 36 mtpa of coal and use the average cargo sizes over the last five years, Berth 1 would be expected to load 19.2 mtpa onto 165 vessels and Berth 2 would load 16.8 mtpa onto 205 vessels for a total of 370 vessels per year. If we reproduce the calculation above using the maximum and minimum average cargo sizes over the last five years and maintain the terminal capacity at a theoretical 36 mtpa, the total number of vessels loaded would range as shown in Figure 4 - 36.0 Terminal mtpa Vessel Size Variation Effects, from 274 vessels to 419 vessels, a potential variation of 145 vessels per year.

36.0 mtpa Terminal mtpa Vessel Size Variation Effects								
Vessel Category	Berth 2 (Tonnes)	Average Vessel Size (Tonnes)	Berth 2 Vessels	Berth 1 (Tonnes)	Average Vessel Size (Tonnes)	Berth 1 Vessels	Berth 1 & 2 (Tonnes)	Berth 1 & 2 Vessels
2019 (Min. Vessel Size)	16,986,412	76,139	223	19,013,588	97,082	196	36,000,000	419
Average Vessel Sizes	16,986,412	82,033	207	19,013,588	116,481	163	36,000,000	370
2016 (Max. Vessel Size)	16,986,412	90,919	137	19,013,588	138,988	137	36,000,000	274
Delta (Max - Min)								145

Figure 4 - 36.0 Terminal mtpa Vessel Size Variation Effects

#### **4 Vessel Calculation – 31.1 mtpa Terminal Capacity with Potash**

If we assume that Westshore were to continue operating Berth 1 at the 2019 coal throughput rate of 31.1 mtpa, replace 4.5 mtpa of the 14.52 mtpa of coal handled at Berth 2 with potash and use the five-year average vessel sizes you would arrive at Berth 1 shipping 16.60 mtpa of coal in 143 vessels and Berth 2 shipping 10.0 mtpa of coal and 4.5 mtpa of potash in 197 vessels for a total of 339 vessels, 23 vessels less than handled in 2019.

#### **5 Vessel Calculation – 36 mtpa Terminal Capacity with Potash (Detailed Calculation)**

If we assume that Westshore can increase coal throughput and achieve 31.5 mtpa of coal in addition to the 4.5 mtpa of potash, the assumption being made in the permit application, and that the five year average coal vessel sizes for Berth 1 and Berth 2 and the BHP provided average potash vessel size are used to calculate the number of vessels, then Berth 1 would be handling 19.5 mtpa into 167 vessels and Berth 2 would be handling 12.0 mtpa of coal into 146 vessels and 4.5 mtpa of potash into 74 vessels, for a combined total of 388 vessels, 18 more vessels than would be the case if Westshore were to handle only coal at a 36 mtpa rate.

In addition to the previous calculation, there will be cleanup required between cargoes, both switching from coal to potash and potash to coal. Westshore is estimating that the cleaning between each cargo will take 8 hours for each change and be required 80% of the time (i.e. back to back coal or potash vessels would not require cleanup). Based on 74 potash vessels per year this will result in approximately 750 hours of washing which will have to be subtracted from the available coal loading time at Berth 2 (Note: potash loading time is fixed due to the required volume of potash to be shipped). This 750 hours of washing is expected to reduce the number of coal vessels loaded at Berth 2 from 146 to 135 thereby reducing the overall additional vessels when handling potash and coal at Westshore from 18 to 7 additional vessels per year.

Again, note that this calculation is based on average cargoes. As seen in Figure 2, there will be fluctuation in actuals vessels numbers year over year based on the actual vessel sizes calling at Westshore any one year.

#### **6 Vessel Calculation – 36 mtpa Terminal Capacity with Potash (Simple Calculation)**

The simplest, but not necessarily most accurate, methodology to estimate additional vessels, and the calculation methodology included in the PER application, is that 4.5 mtpa of coal carried in vessels with an average cargo size of 82,023 tonnes will be replaced at a one-to-one ratio with 4.5 mtpa of potash carried in vessels with an average cargo size of 60,816 tonnes. This calculation results in 19 additional vessels being required on an annual basis to carry 4.5 mtpa of potash, a conservative estimate of additional vessels and one that results in the number of additional vessels being predicted falling well within the variation in number of vessels associated with changes over the last five years resulting from average vessel size fluctuation.