Burnaby Refinery Crude Supply

Prepared for:
Chevron Canada Limited
May 2012

Wood Mackenzie
downstream consulting

Burnaby Refinery Crude Supply

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Chevron's Burnaby Refinery relies on the TransMountain pipeline (TMPL) for crude oil delivery and recently Alberta crude oil prices have developed substantial discounts to internationally traded grades. Severe pipeline apportionment has resulted as demand from USWC refiners has increased and the facility has not obtained the oil deliveries from Western Canadian Sedimentary Basin (WCSB) that it wishes. Chevron is contemplating a PDD Application to the NEB in accordance with the provisions of TMPL Tariff 86 as a potential remedy to this situation. In relation to the Application, this report sets out Wood Mackenzie's independent assessment to the following two questions:

How long and to what extent is the present discount of Canadian Crude oil relative to world oil prices likely to persist?

What are the alternative sources of crude oil and the modes of transportation for delivery to the Burnaby refinery?

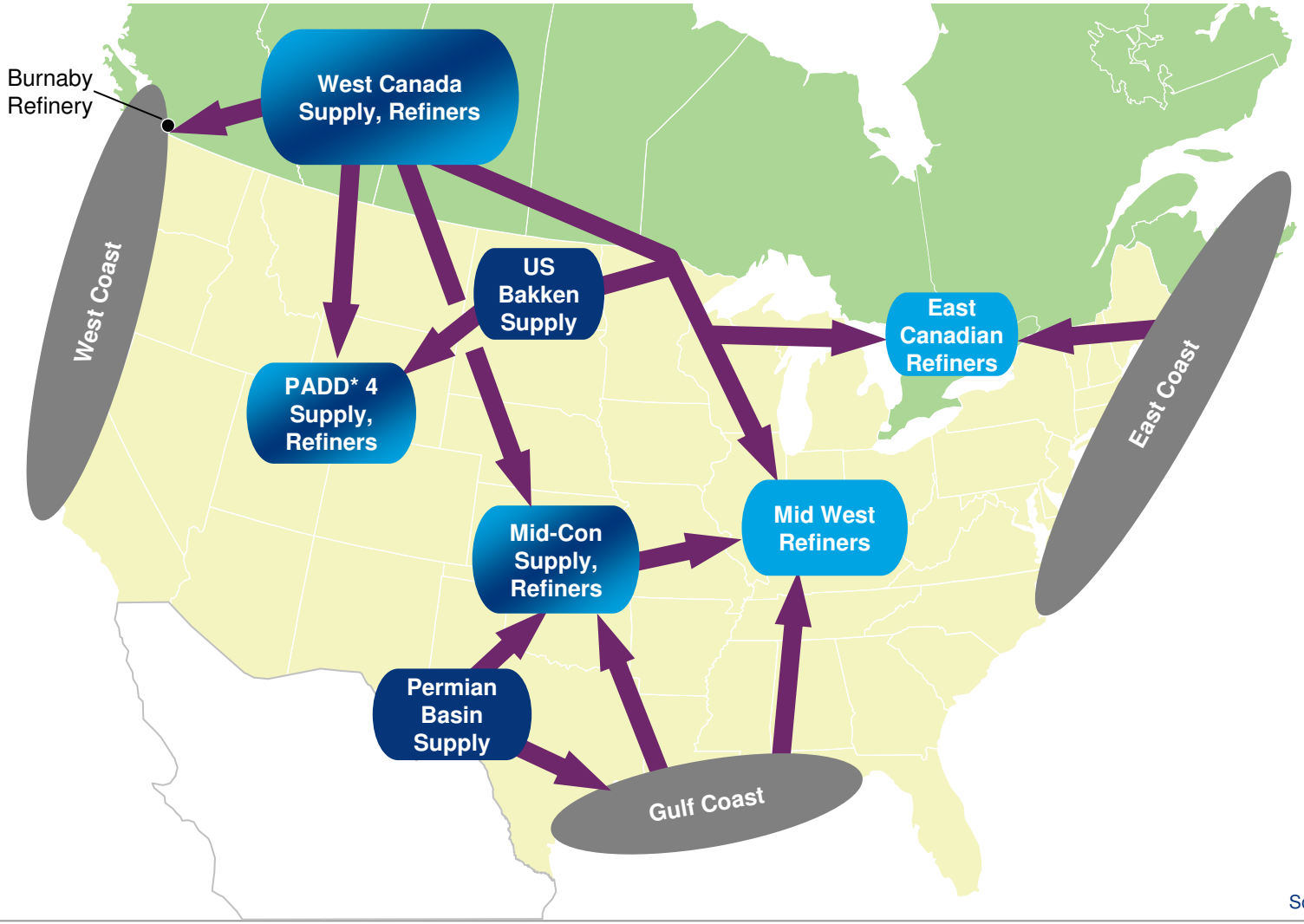
Skip York

Vice President Downstream Consulting, Americas

Agenda

1	How long and to what extent will the Canadian crude discount persist?
2	What are the alternative sources of crude and transport options for Burnaby?
3	Conclusions

Across in-land North America there are numerous major crude oil supply and demand zones linked by large capacity pipeline corridors



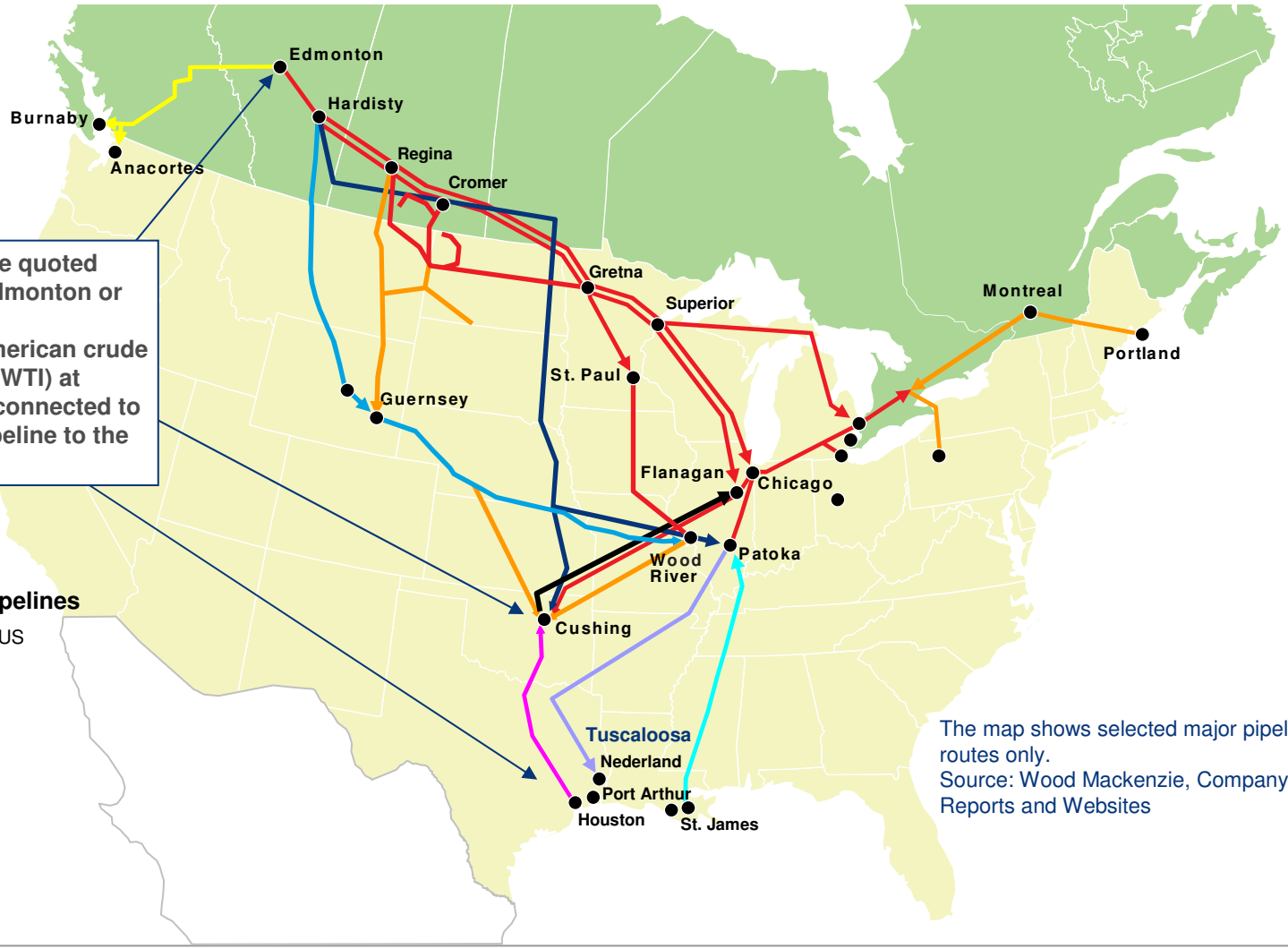
Source: Wood Mackenzie

* PADD = Petroleum Administration Defense District

The pipelines taking West Canadian crude production to market are integrated with other systems, which together form a very complex North American network

Selected Major North American Pipeline Routes

Canadian crude oil prices are quoted publicly (e.g. by Platts) at Edmonton or Hardisty.
The common benchmark American crude is West Texas Intermediate (WTI) at Cushing, Oklahoma – itself connected to international markets via pipeline to the US Gulf Coast

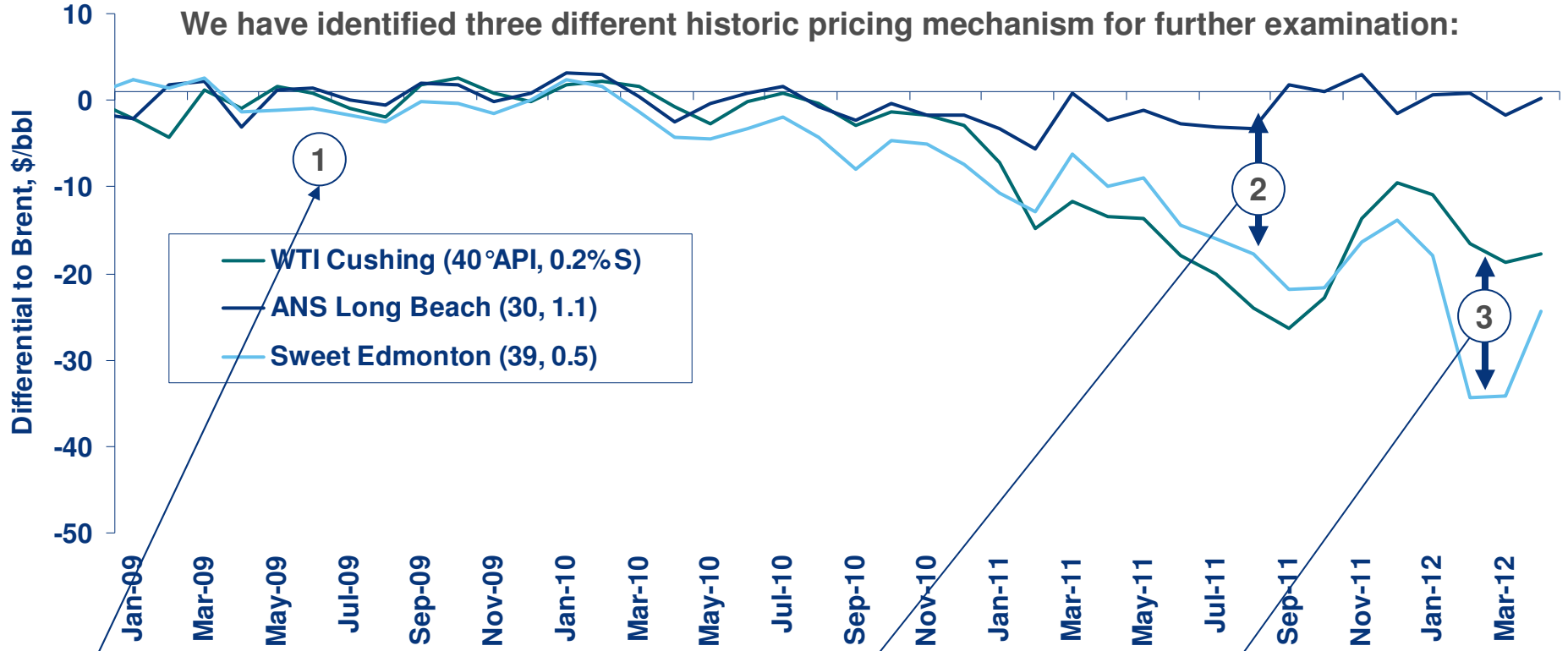


Selected US & Canadian Crude Oil Pipelines

- Enbridge pipelines and connections to the US
- Kinder Morgan Express/Platte
- Kinder Morgan TMPL
- TransCanada Keystone Main
- Exxon Pegasus
- Seaway (before recent reversal)
- Capline
- BP
- Other

The map shows selected major pipeline routes only.
Source: Wood Mackenzie, Company Reports and Websites

Canadian crude prices have become increasingly discounted versus internationally traded grades (Brent), and recently to WTI at Cushing, primarily due to infrastructure constraints



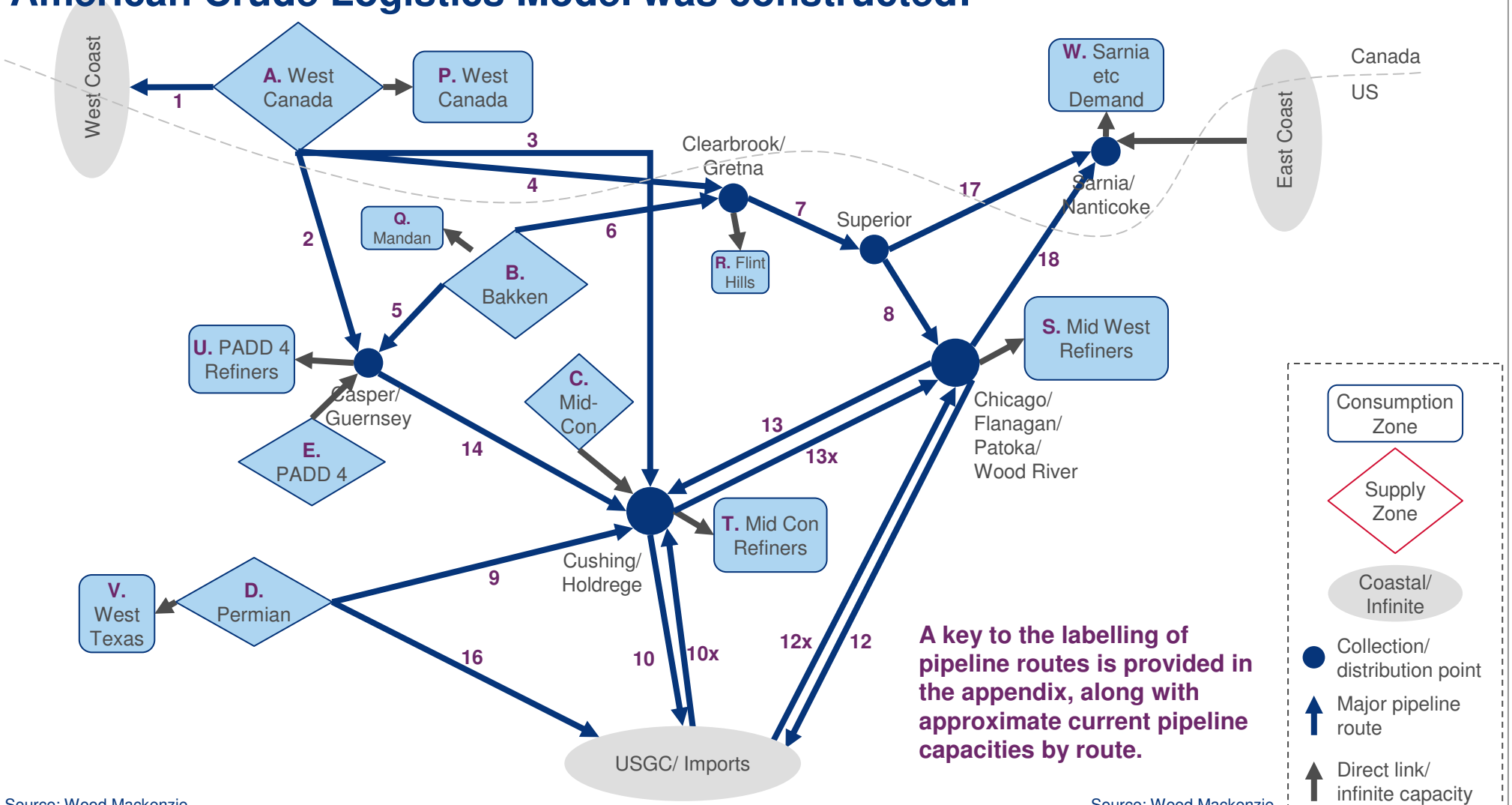
Pricing Mechanism 1 (2009):
WTI, Canadian crudes and West Coast crudes such as Alaska North Slope (ANS) all trading in close relationships to the international benchmark Brent crude oil.

Pricing Mechanism 2 (2011):
A discount for Canadian crudes versus Brent emerged through 2011, in conjunction with the well-publicised divergence of WTI and Brent.

Pricing Mechanism 3 (2012):
A further discount versus WTI has emerged recent months, exaggerating the disconnect to Brent.
Sea-borne ANS remains closely related to Brent throughout, driving a huge incentive to move volume through TMPL.

Source: Wood Mackenzie, Platts

In order to understand and forecast these mechanisms a simplified North American Crude Logistics Model was constructed:



Source: Wood Mackenzie

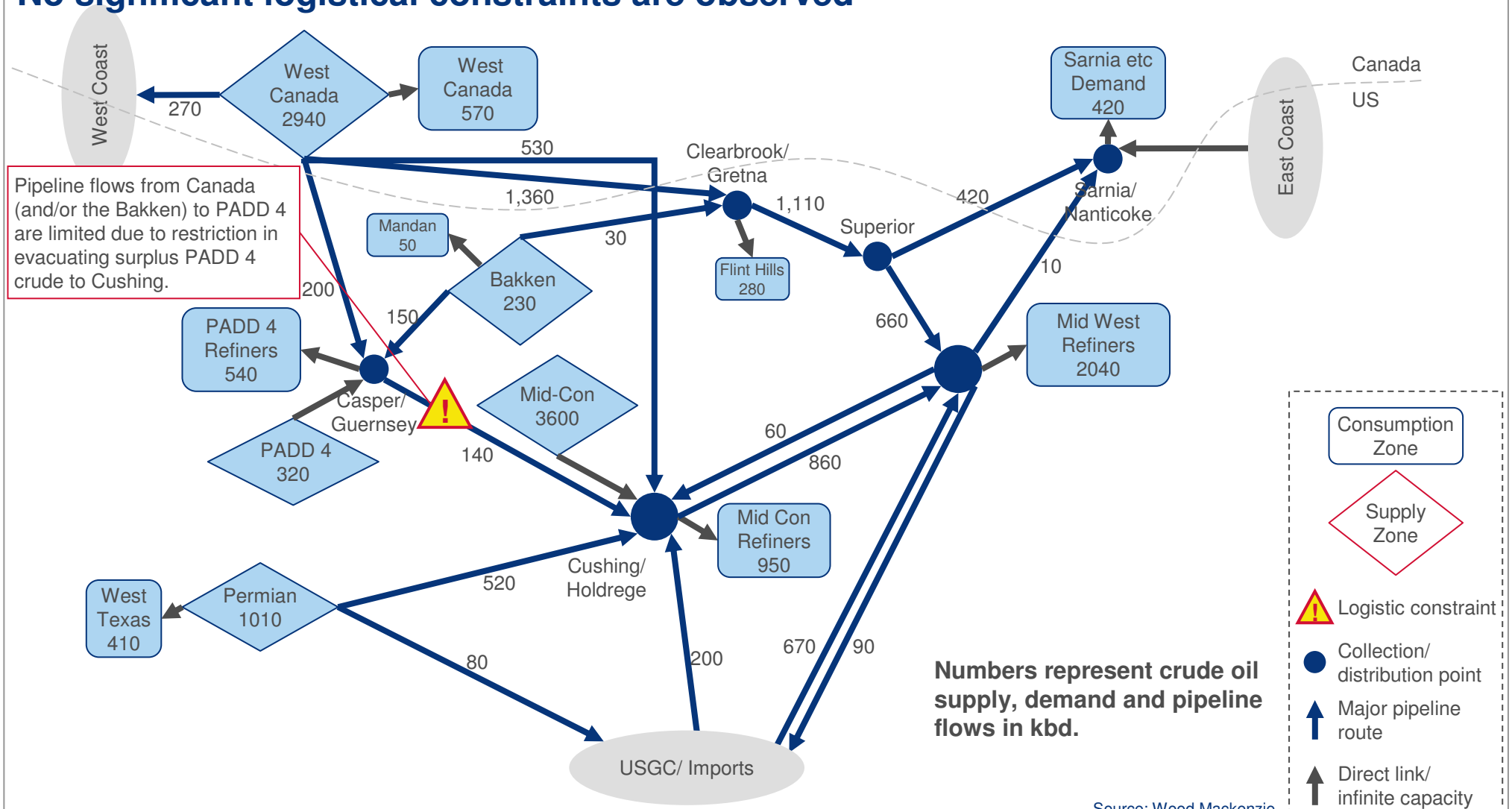
Source: Wood Mackenzie

Gulf Coast includes Eagle Ford and other non-Permian volumes linked to Gulf Coast.
Utica/Marcellus included in East Coast.
Mid West includes St Paul Northern Tier refinery.
W. Texas includes Borger and McKee, but Cushing fees ~40kbd to Borger

A robust set of model inputs were produced leveraging Wood Mackenzie's well established research methodologies

- **The intent of this section of the study is to explain the pricing mechanisms observed historically and then to forecast the likely developments in North American crude oil pricing relationships**
  - The study period is to the year 2020
- **In order to do so, Wood Mackenzie endeavoured to populate the simplified North American crude logistics model with historic and forecast data**
- **The three major inputs into the model are:**
  - "Upstream" crude oil supply volumes (adjusted to account for bitumen dilution where appropriate)
  - "Downstream" refinery crude demand
  - Pipeline capacities by route: existing assets, and potential projects
- **These inputs are produced by Wood Mackenzie's according to it's well-tested industry accepted methodologies, which have been developed over many years in our highly valued subscription-based research products**
- **Summaries of Wood Mackenzie's methodologies for producing the model inputs are provided as appendices to this report**

NA Crude Logistics: Simplified Basis – **2009 Modelled Flows (kbd):**
No significant logistical constraints are observed



Source: Wood Mackenzie

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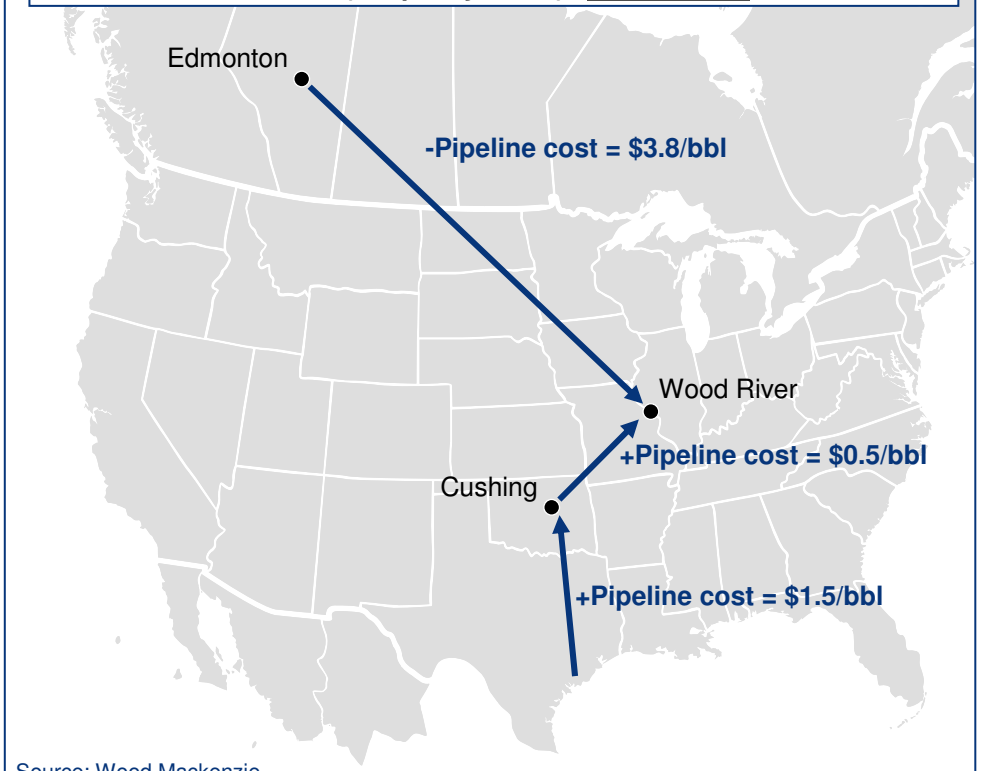
The 2009 modelling shows that spare capacity to move crude oil where it was needed meant inland prices were quite closely related to Brent

- In 2009 WTI was priced at Cushing in parity to Brent (adjusted for international freight costs and quality differences) as imports into the Mid Con were required and there was sufficient north-bound pipeline capacity to achieve this
- The Mid West was also importing from the Mid-Con, the USGC and Canada
- The marginal buyer of light sweet Canadian crude oil (for which Edmonton-based price quotes are published) was most likely in the Mid West, e.g. near Wood River, IL
- Wood Mackenzie estimates that this price setting mechanism results in an Edmonton differential to Brent of -2 $/bbl before ship freight and quality adjustments i.e. relative parity compared to the very large recent discounts
- Crude markets on the West Coast are directly accessible to international crude markets and so, however distantly, show a relatively consistent relationship to Brent crude prices

2009 Example Price Setting Mechanisms

Edmonton = USGC + pipe to Cushing + pipe to Wood River – pipe from Edmonton (+/- quality affect)

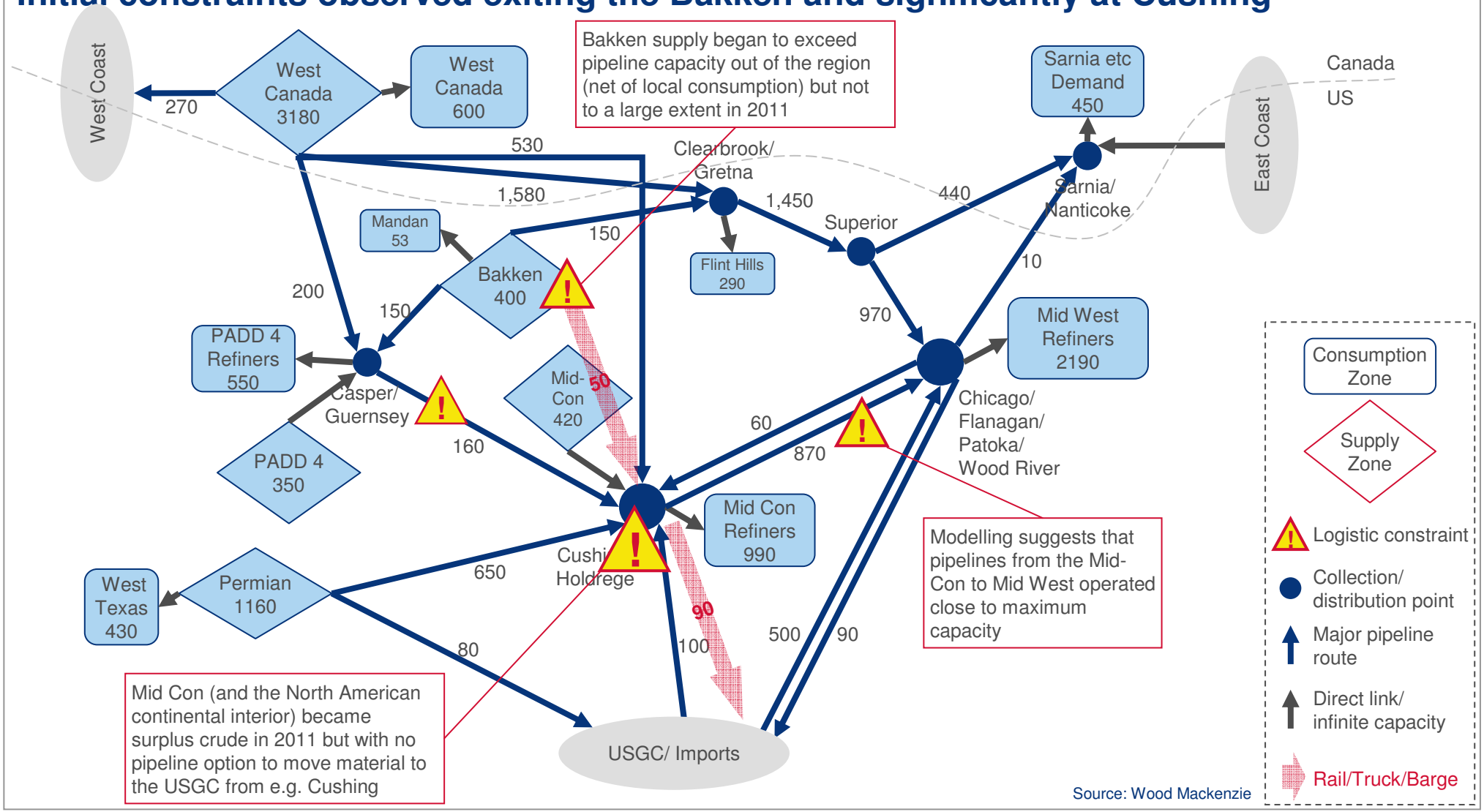
= -1.8 $/bbl (+/- quality affect) versus Brent



Source: Wood Mackenzie

NA Crude Logistics: Simplified Basis – **2011 Modelled Flows (kbd)**

Initial constraints observed exiting the Bakken and significantly at Cushing



Source: Wood Mackenzie

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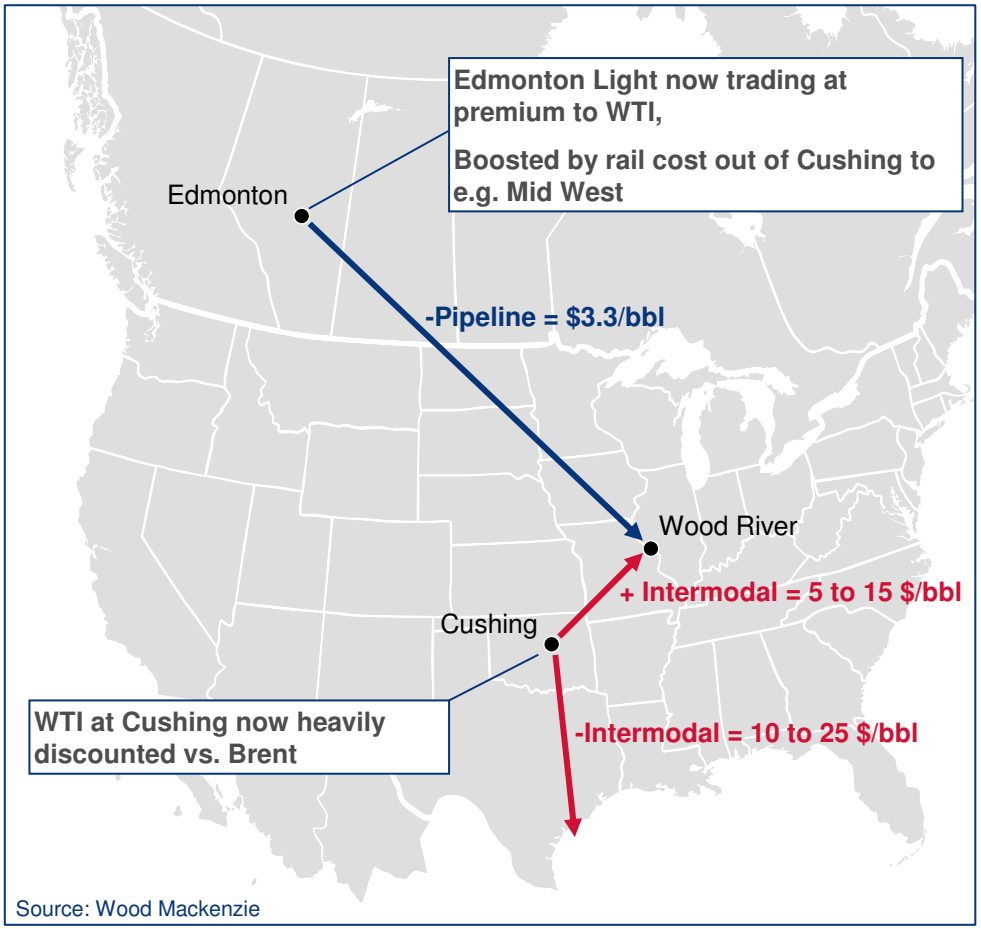
2011 discounts were driven by a surplus of crude in the Mid Con and a lack of infrastructure to evacuate it cheaply

- **WTI at Cushing became discounted to Brent as in-land supply increased**
  - Supply increased form Canada, the Bakken and PADD 4
  - Flows form the south into Cushing stopped as surpluses built here
- **This resulted in a 10 to 25 $/bbl discount for WTI vs Brent throughout the year**
- **The alternative – to use road trucks or rail cars to move the crude to the USGC – is much more expensive than pipelines**
  - Rail is generally cheaper than trucking
  - In transitory periods when e.g. rail capacity is very tight, the high cost of alternatives (trucks) to move material from Cushing drives the WTI discount to Brent to extreme levels
- **This depressed in-land crude prices (including at Edmonton) as alternative evacuation routes to coastal markets are limited**
- **At the same time, our modelling suggests that pipeline capacity from linking the Mid Con to the Mid West would have been incentivised to operate at relatively full utilisation (Keystone Base, BP, Ozark, and Platte pipelines)**
- **Hence the marginal in-land buyer would at times pay WTI Cushing minus the cost of rail delivery from Cushing**
- **With pipeline capacity still available from Canada to the Mid West the Edmonton price remained closely related to WTI Cushing, but the tight outbound capacity from Cushing to the Mid West resulted in Canadian Light grades trading at a premium to WTI**
- **Never the less Canadian Sweet at Edmonton became discounted versus crude prices on the West Coast (e.g. ANS) due to the affect of the Mid Con (Cushing) surplus**
  - Because the TMPL pipeline was running at full capacity it was not the marginal source of supply and had no effect on the Edmonton price setting mechanism

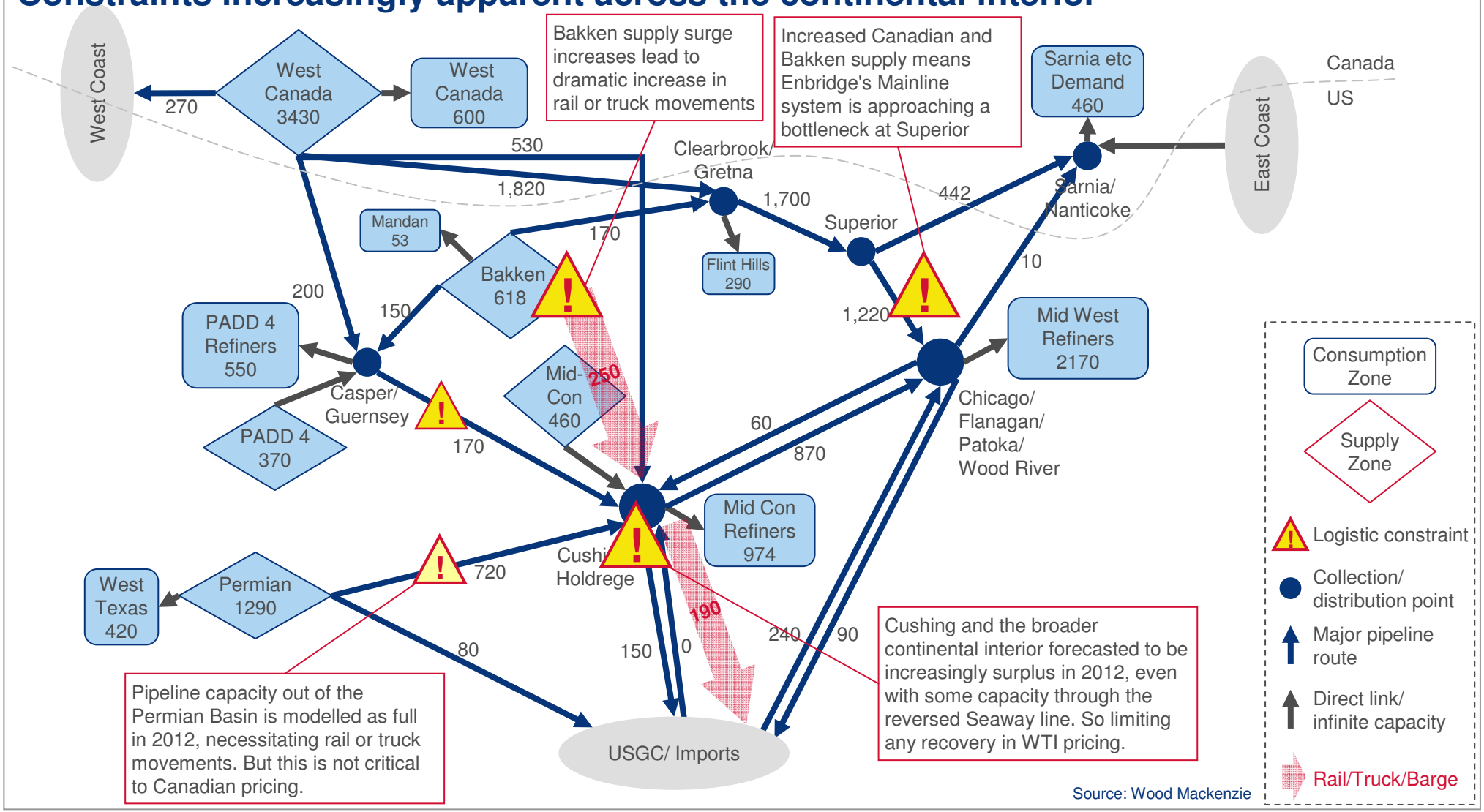
2011 Example Price Setting Mechanisms



Source: Wood Mackenzie

NA Crude Logistics: Simplified Basis – **2012 Modelled Flows (kbd)**

Constraints increasingly apparent across the continental interior



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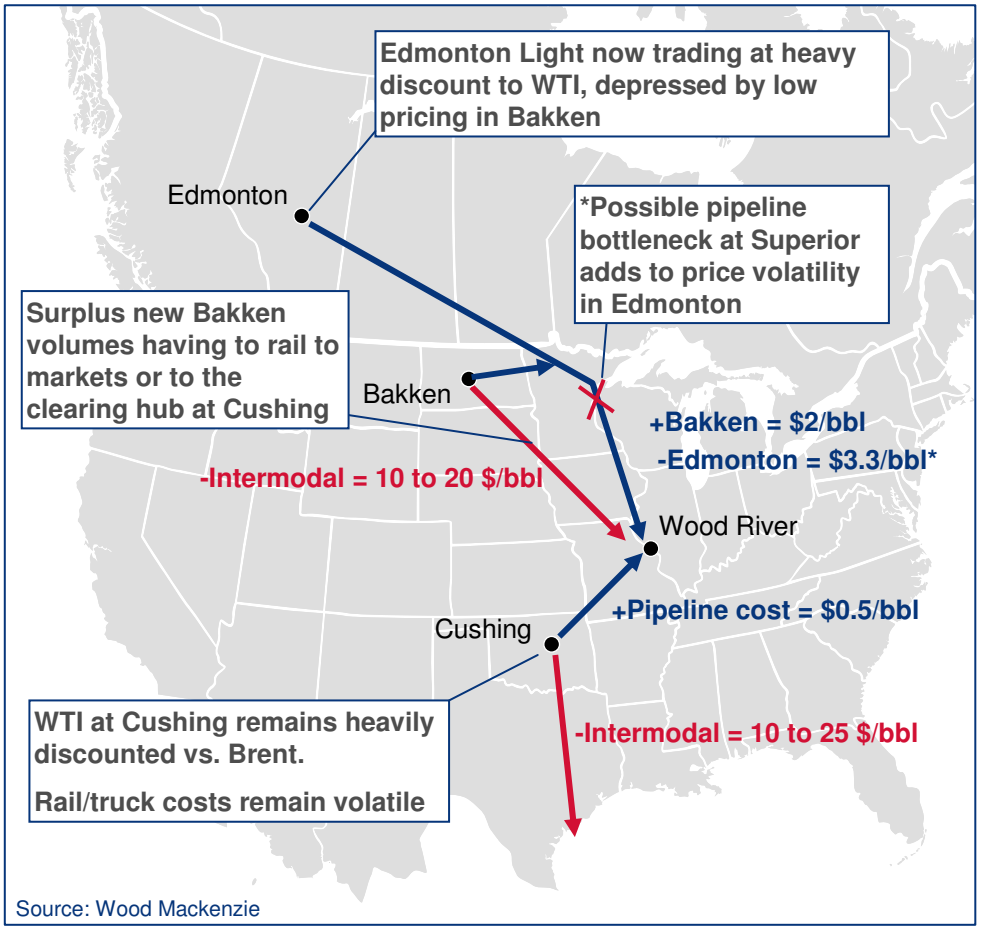
Recent increases in the discounts reflect capacity constraints in the Northern US which disconnect Edmonton pricing from WTI in Cushing

- **Over the last few months Mid Con surpluses have worsened and WTI discounts to Brent remained very large (and volatile)**
- **2012 Canadian supply will be ~250 kbd higher than 2011 however spare capacity remains in the Enbridge Mainline north of the border**
- **Bakken supply continues to surge and pipeline capacity out of North Dakota is now understood to be full**
- **Rail or trucks are now required to move Bakken production to the Mid Con, USGC, PADD 4, or to Clearbrook for delivery to the Mid West**
  - This is lowering the price of crude oil in the Bakken, and more generally north of the Mid Con/Cushing area
  - Mid West Refiners who have nominated for capacity in the system, which is otherwise full could have pricing power over Bakken suppliers, whose alternative is to rail or truck their crude to market
  - Canadian crude competes with Bakken to supply refineries in the North Mid West who can alternatively buy cheap Bakken via the same pipeline system
- **Furthermore, the increased surpluses of crude oil from Canada (and Bakken) are now testing the capacity of the Enbridge Mainline system**
  - Although there is available capacity in Canada and at Clearbrook, further south at Superior capacity has become quite tight
  - Enbridge Mainline has total currently nameplate capacity south of Superior of 1330 kbd
  - We estimate flows for 2012 to average over 1200 kbd., suggesting utilisation over 90%
  - We consider this to be close to the effective maximum when accounting for batching operations, maintenance, inspection, etc.
- **This results in further downward pressure on Edmonton pricing and is very likely to result in volatile prices, with traders highly sensitive to potential pipeline interruptions etc**

2012 Example Price Setting Mechanisms



Source: Wood Mackenzie

To forecast discounts we must examine three distinct logistical constraints, but indications are that Canadian crude price discounts will continue to fluctuate through 2012

- **The 2012 year to date crude price discount (~30 $/bbl for light sweet crude) in Edmonton vs Brent is believed to be a result of three distinct logistical constraints, one in the Mid Con and two in the Northern US:**
  - Insufficient south-bound Mid Con/Cushing evacuation capacity, AND:
  - Tight capacity in Canadian crude oil pipelines in Northern US, OR Insufficient Bakken evacuation capacity (both of which have the effect of depressing prices at Clearbrook and hence Edmonton
- **The Seaway pipeline reversal (completed in May, see next page) allows some volumes to move cheaply from Cushing to the USGC following completion in May**
- **However continued production increases, notably including Imperial Oil's first phase of their large Kearl Oil Sands project (due to commence production in late 2012), will likely put considerable pressure back onto the system and lower Edmonton prices**
- **The price volatility driven by over-stretched rail and truck markets and pipelines operating close to maximum sustainable capacity mean that predicting the level of discount for the rest of the year is an inexact science**
- **This challenge remains moving forwards, but our approach is to examine the fundamentals of supply and demand and consider the impacts of these in conjunction with likely logistical developments around the three logistical constraints listed above**

There are some "firm" pipeline projects that should serve to help alleviate the constraints in the short term

Wood Mackenzie Assessed "Firm" North America Crude Oil Pipeline Projects

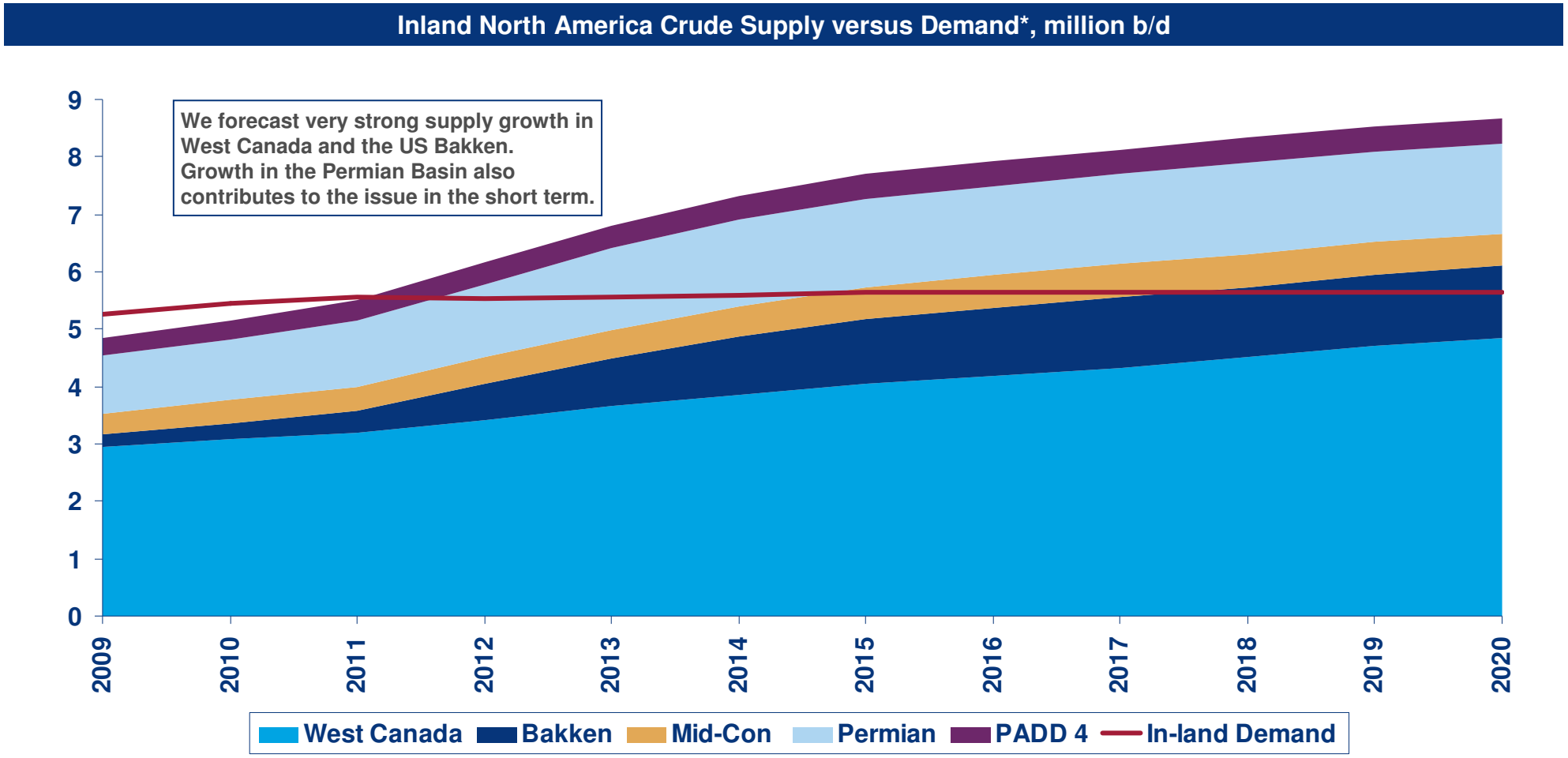
Pipeline/Project	Operator	From	To	Route Label	kbd	Date Onstream*	Assessed Status[2]
Bakken Expansion US (into Enbridge Mainline)	Enbridge	Beaver Lodge, ND	Cromer, Manitoba	6	120	1Q 2013 target	Under construction
Seaway Reversal	Enbridge/Enterprise	Cushing	Freeport	10/10x	150/400	May-12	Completed recently
Keystone XL USGC Project (Phase IV)	TransCanada	Cushing	Port Arthur	10	830	Late 2013	Proposed. Approved
Basin Pipeline Expansion	PAA	-	Cushing	9	50	Mar-12	Under construction (Complete?)
Enbridge Line 5 Expansion	Enbridge	Superior, WI	Sarnia, ON	17	50	Late 2012	(Likely) Under construction
West Texas - Houston Access	Sunoco	Midland	Houston	16	40	2012	Complete

[1]Announced date, where known, otherwise Wood Mackenzie assessment of soonest likely date.
[2]**Wood Mackenzie assesses the status each pipeline project as one of the following:** *Rumoured, Under Study, Proposed, no approval, Proposed & approved, Under construction, Complete, Abandoned,* **or** *On Hold*
"Approved" refers to the granting of major regulatory or permitting approvals. A project must at least have these approvals to be considered "Firm"

- **The two most significant "firm" projects are Enbridge's Seaway reversal, and the Southern leg of TransCanada's Keystone XL project, both of which are focussed on increasing flows from Cushing to the USGC**
- **The Seaway pipeline restarted in a south-bound direction, initially at 150 kbd in May 2012, and will ramp up to an average 400 kbd by 1Q 2013**
- **The earliest onstream date for Keystone to the USGC is reported as late 2013. For the purposes of our modelling, we assume 2014**

Source: Wood Mackenzie

But sustained strong in-land crude supply growth is forecast, which will keep up the pressure on crude oil logistics



Source: Wood Mackenzie

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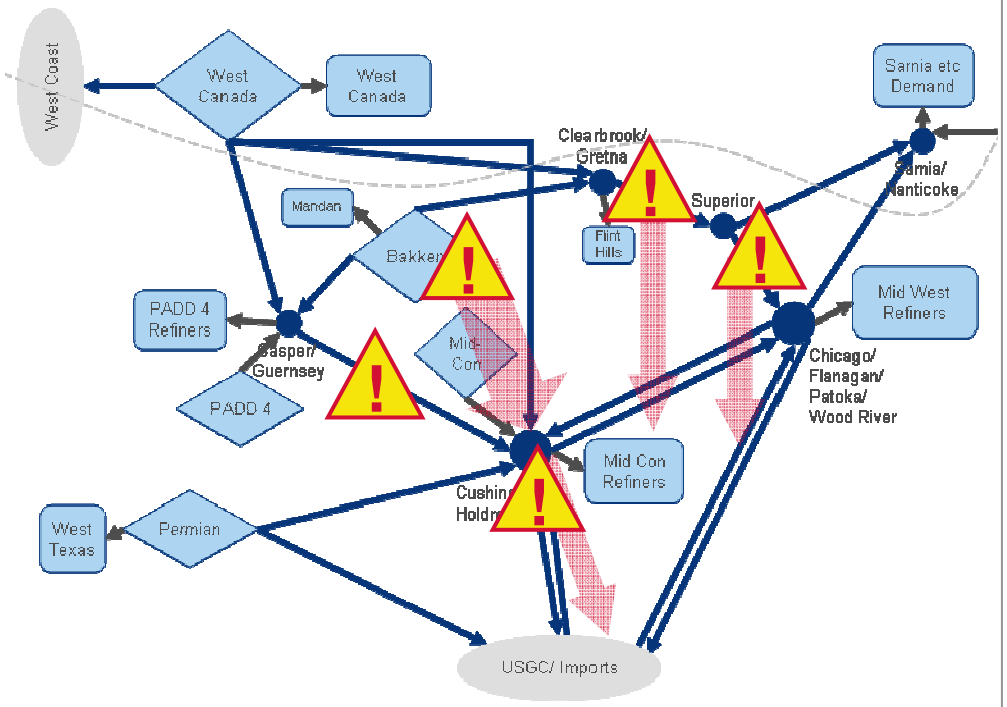
Unless other large pipeline projects are successfully progressed, the price discounts in Canada seem unlikely to be alleviated on a sustained basis

- **A significant capacity shortage arises in Ex-Canada pipelines in 2013 unless e.g. Enbridge does something to clear the impending bottleneck on their Mainline at Superior (which is exacerbated by the Enbridge project to increase flow from the US Bakken into the Mainline**
  - Expansion of the pipeline from the Bakken to Mainline contributes to the bottleneck
  - Rail, truck or barge movements must result – either from Superior, North Dakota, or further North
- **By 2014 accretive supply volumes from Canada mean another bottle neck on the Mainline appears at Clearbrook**
- **Rail volumes out of the Bakken increase despite Enbridge's project as supply growth there is so strong**
  - As a result, the volume forced to move by rail or truck increases from 250 kbd in 2012 to over 450 kbd in 2013, and nearly 650 kbd in 2015
- **The situation at Cushing actually worsens further in 2013 as incoming supply increases by more than the evacuation capacity brought on by the reversed Seaway pipeline**
- **Growth in volumes from the North actually mean that the Keystone XL Cushing-USGC leg (assumed in 2014, 830 kbd) is barely sufficient to clear the inland surplus in it's first year, and significant rail evacuation to the coastal market return in 2015 in our simplified logistics modelling**

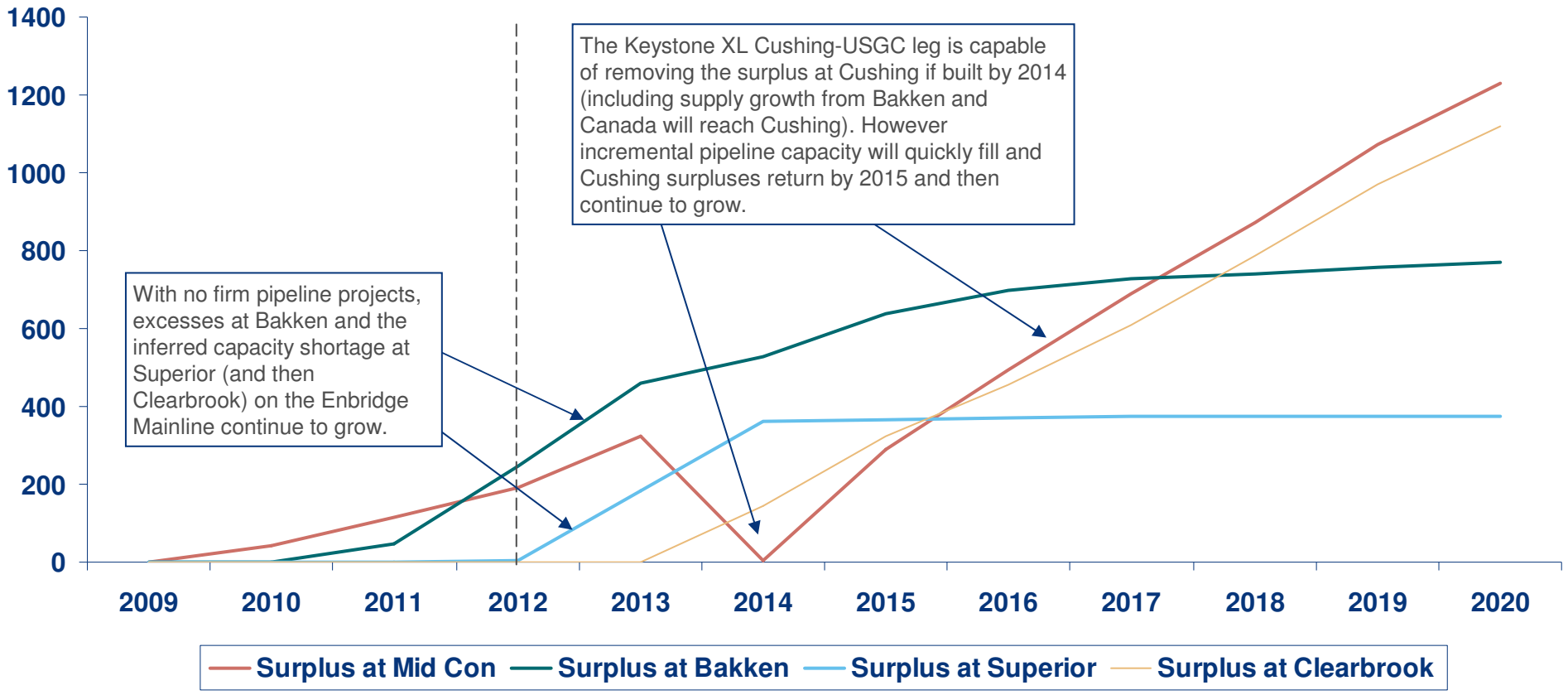


Detailed

Source: Wood Mackenzie

Post 2014, the challenge increases at each of the identified pinch-points unless further (less firm) investment in pipeline capacity is implemented

Forecasted Logistical Constraint Points – Firm Projects Only, kbd



Source: Wood Mackenzie

Notes:
Mid Con surplus figures include railed volumes from the Bakken.
Development of the surplus at Clearbrook means the downstream surplus at Superior stops growing in 2014.

There are many other (less firm) pipeline projects in discussion

"Uncertain" North America Crude Oil Pipeline Projects

Pipeline/Project	Operator	From	To	Route Label[1]	kbd	Date Onstream[2]	Assessed Status[3]	Likelihood[4]
Mainline debottleneck (to cope with Bakken Project)	Enbridge	Clearbrook	Mid West	7, 8	-	Assume 2014	Under Study	**Likely**
TransMountain Expansion/Twinning	Kinder Morgan	Edmonton	Vancouver/ Kitimat	1	550	2017	Proposed. No approval	Unlikely[6]
Northern Gateway Pipeline	Enbridge	Bruderheim AB	Kitimat, BC	1	520	End 2017	Proposed. No approval	**Likely[6]**
Line 9 Reversal to Montreal	Enbridge	Sarnia, ON	Montreal, QC	19[5]	200	2014	Under study	**Likely**
Portland to Montreal Pipeline Reversal	PMPL	Montreal QC	Portland, ME	19[5]	200	2015	Rumoured	Unlikely
New Pipeline (or repurposed gas pipe)	TransCanada	Alberta	Montreal/E. Coast	20[5]	625	>2017	Under Study	Unlikely
Seaway Loop Expansion	Enbridge/Enterprise	Cushing	Freeport	10	400	Mid-2014	Proposed. No approval	**Likely**
Keystone XL Northern Leg (Phase III)	TransCanada	Hardisty	Cushing	3	830	2015	Proposed. No approval	**Uncertain**
Alberta Clipper Expansion	Enbridge	Hardisty	Superior, WI	4, 7	350	2015	Under study	**Likely**
WhiteCliffs ExLoop	Semgroup	Plattville, CO	Cushing	14	-	-	Under study	**Likely**
Saddle Butte Pipeline	High Prarie	Alexander, ND	Clearbrook, MN	6	150	End 2013	Proposed. No approval	Unlikely
Pony Express	Kinder Morgan	Guernsey, WY	Cushing	14	210	1Q 2014	Proposed. No approval	Unlikely
Gulf Coast Access Flanagan South	Enbridge	Flanagan, IL	Cushing	13	585	Mid-2014	Proposed. No approval	**Likely**
Longhorn Reversal	Magellan	Crane, TX	Houston	16	225	Mid-2013	Proposed. No approval	**Likely**
New Pipeline	Magellan	LaSalle, Texas	Corpus Christi, TX	16	-	-	Abandoned?	Unlikely
West Texas - Nederland Access	Sunoco	Midland	Nederland, TX	16	30	2013	Proposed. No approval	**Likely**
West Texas - Longview Access	Sunoco	Midland	Longview, TX	9	30	2013	Proposed. No approval	Unlikely
Wrangler	Enterprise/Enbridge	Cushing	USGC	10	800	-	Abandoned	Unlikely
Texas Access	Enbridge/ExxonMobil	Patoka	Beaumont	12	400	-	Abandoned	Unlikely
Butte Loop	-	Baker, ND	Casper, WY	5	50	2012	Rumoured	Unlikely
Plains Bakken North	PAA	Trenton, ND	Regina, SK	6	70	2012	Abandoned?	Unlikely
Magellan Products Reversal	Magellan	Unknown	USGC	-	70	-	Rumoured.	Unlikely
Bakken Crude Express	ONEOK Partners LP	Williston Basin	Cushing, OK	5,14	200	2015	Proposed. No approval	**Likely**

[1]Pipeline system model guide with route labelling included as appendix.

Source: Wood Mackenzie

[2]Announced date, where known, otherwise Wood Mackenzie assessment of soonest likely date.
[3]Woodmac assessed status of each pipeline project at time of writing. "Approval" refers to granting of major regulatory or permitting approvals.
[4]Woodmac qualitative assessment: likelihood of going ahead by 2020. Further detail provided as an appendix.
[5]Proposed route is not included in base model. See model diagram in appendix for key to new pipeline routes.
[6]Assumption. Wood Mackenzie judges it likely that one of the two proposed Canadian West Coast routes will be implemented by 2020.

The Cushing surpluses may be helped in the longer term by the proposed doubling of the Seaway pipeline, and projects that evacuate Canadian crude East or West instead of South towards the Mid Con

"Uncertain" Crude Oil Pipeline Projects – Acting to Resolve Cushing Surplus

Pipeline/Project	From	To	Route Label	kbd	Date Onstream	Assessed Status	Likelihood	Helps Cushing Surplus?
TransMountain Expansion/Twinning	Edmonton	Vancouver/ Kitimat	1	550	>2017[1]	Proposed. No approval	Unlikely[4]	Yes, as less Canadian crude into the US
Northern Gateway Pipeline	Bruderheim AB	Kitimat, BC	1	520	End 2017	Proposed. No approval	Likely[4]	As above
New Pipeline	Alberta	Montreal / East Coast	20	625	>2017[2]	Under Study (conceptual proposal)	Unlikely	As above
Seaway Loop Expansion	Cushing	Freeport	10	400	Mid-2014	Proposed. No approval	Likely	**Yes**
Longhorn Reversal	Crane, TX	Houston	16	225	Mid-2013	Proposed. No approval	Likely	Only once railed volumes from Permian basin to SGC are eliminated.
West Texas - Nederland Access	Midland	Nederland, Texas	16	30	2013	Proposed. No approval	Likely	As above
Magellan Products Reversal	Unknown[3]	USGC	10	70	-[3]	Rumoured.	Unlikely	**Yes**

› **Modelling notes:**

[1]Assume 2019

[2]Assume 2020

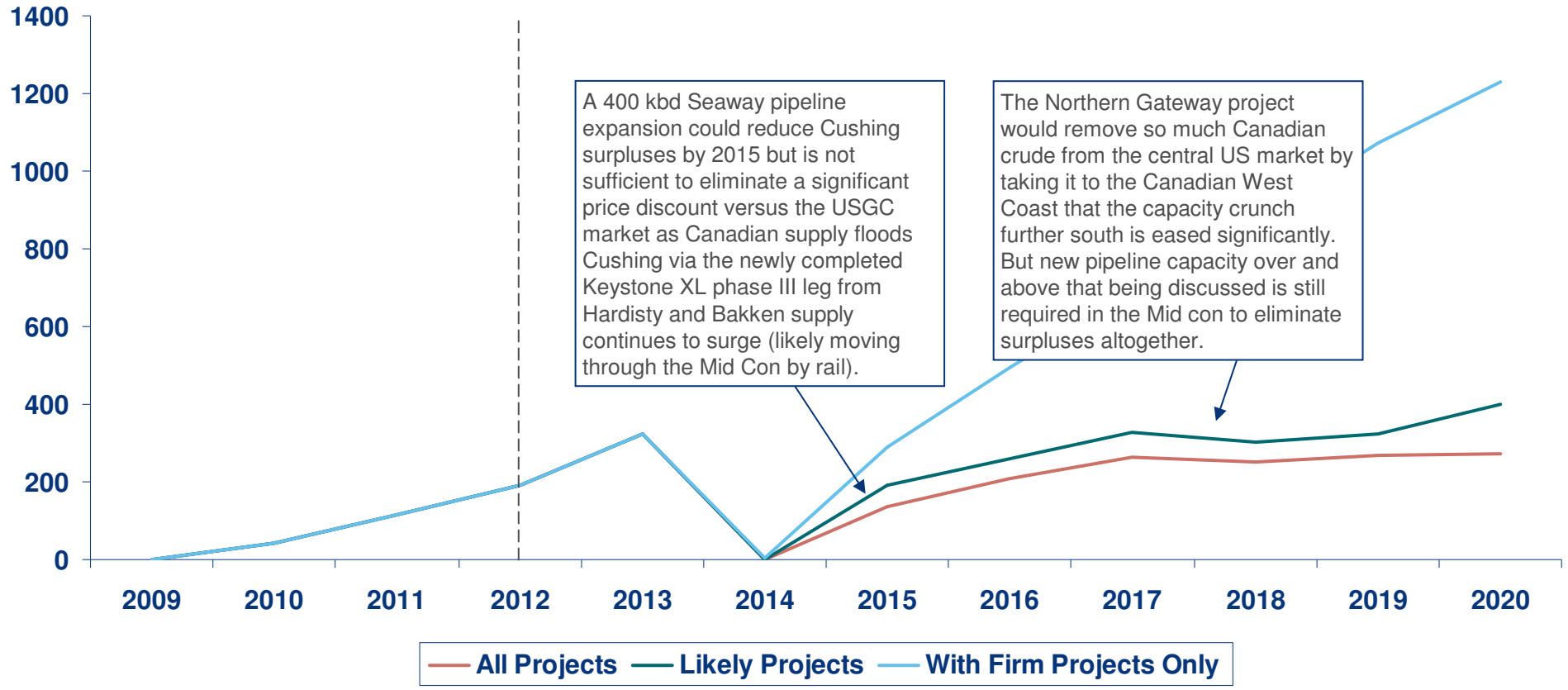
[3]Assume Cushing 2015

[4]Assumption. Wood Mackenzie judges it likely that one of the two proposed Canadian West Coast routes will be implemented by 2020, but not both. For the purposes of modelling we assume Northern Gateway is successful and TME is not.

Source: Wood Mackenzie

But even the inclusion of projects that are considered "unlikely" does not solve the structural surplus at Cushing

Modeled and Forecast Mid Con Crude Surplus, kbd



Source: Wood Mackenzie

Note: Mid Con surplus figures include railed volumes from the Bakken.

Many projects could indirectly help the logistics situation in the Bakken, but pipelines to directly evacuate Bakken crude are limited

"Uncertain" Crude Oil Pipeline Projects – Acting to Resolve Bakken Surplus

Pipeline/Project	From	To	Route Label	kbd	Date Onstream	Assessed Status	Likelihood	Helps Bakken Surplus?
Enbridge Mainline	-	-	7,8	?[1]	Assume 2014	Under Study.	Likely	Provides space in Enbridge Mainline to accept increased flows through route 6
TransMountain Expansion/Twinning	Edmonton	Vancouver/ Kitimat	1	550	>2017[2]	Proposed. No approval	Unlikely[7]	Frees space in Enbridge Mainline to accept increased flows through route 6
Northern Gateway Pipeline	Bruderheim AB	Kitimat, BC	1	520	End 2017	Proposed. No approval	Likely[7]	As above
New Pipeline	Alberta	Montreal / East Coast	20	625	>2017[3]	Under Study (conceptual proposal)	Unlikely	As above
Keystone XL Northern Leg (Phase III)	Hardisty	Cushing	3	830	2015	Proposed. No approval	Uncertain[4]	As above
Butte Loop	Baker, ND	Casper, WY	5	50	2012?[6]	Rumoured	Unlikely	**Yes**
Saddle Butte Pipeline	Alexander, ND	Clearbrook, MN	6	150	End 2013	Proposed. No approval	Unlikely	**Yes**
WhiteCliffs ExLoop	Plattville, CO	Cushing	14	?[5]	-[5]	Under study	Likely	Eases congestion in Canada. Needs route 5 expansion and Mid Con solution to truly benefit
Pony Express	Guernsey, WY	Cushing	14	210	1Q 2014	Proposed. No approval	Unlikely	As above

› **Modelling notes:**

[1]Assuming 200 kbd capacity increase between Clearbrook and Mid West (via Superior); equivalent to +15% of capacity south of Superior

[2]Assume 2019

[3]Assume 2020

[4]Modelling as "likely"

[5]Assume parallel line run (extra 70kbd) in 2014

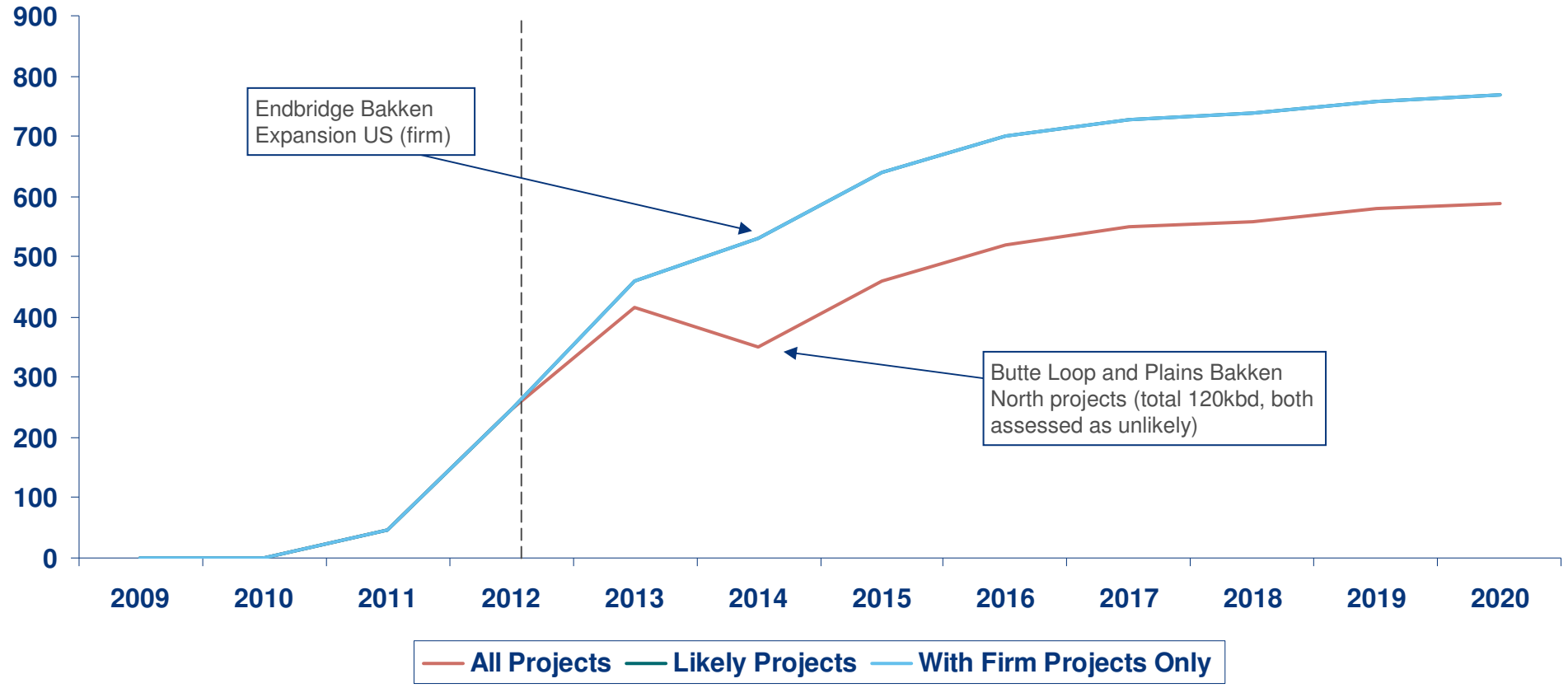
[6]Assume 2013

[7]Assumption. Wood Mackenzie judges it likely that one of the two proposed Canadian West Coast routes will be implemented by 2020, but not both. For the purposes of modelling we assume Northern Gateway is successful and TME is not.

Source: Wood Mackenzie

Large new (currently unannounced) pipelines are needed to avoid scale rail or truck crude oil movements from the Bakken

Modeled and Forecast Bakken Crude Surplus, kbd



Source: Wood Mackenzie

Many proposed or rumoured pipeline projects could help resolve the implied bottleneck at Superior (and Clearbrook)

"Uncertain" Crude Oil Pipeline Projects – Acting to Resolve Bottlenecks at Superior/Clearbrook

Pipeline/Project	From	To	Route Label	kbd	Date Onstream	Assessed Status	Likelihood	Helps Superior/Clearbrook Bottleneck?
Enbridge Mainline	-	-	**7,8**	?[1]	Assume 2014	Under Study.	Likely	**Yes**
TransMountain Expansion/Twinning	Edmonton	Vancouver/ Kitimat	**1**	550	>2017	Proposed. No approval	Unlikely[5]	**Yes**, as reduces need to utilise Enbridge Mainline
Northern Gateway Pipeline	Bruderheim, AB	Kitimat, BC	**1**	520	End 2017	Proposed. No approval	Likely[5]	**As above**
Line 9 Reversal to Montreal	Sarnia, ON	Montreal, QC	**19**	200	2014	Under study	Likely	Only if spare capacity upstream of Superior (likely in short term)
Portland to Montreal Pipeline Reversal	Montreal QC	Portland, ME	**19**	200	2015	Rumoured	Unlikely	As above (this project needed to ensure Enbridge line 9 reversal can evacuate to coast?)
New Pipeline	Alberta	Montreal / East Coast	**20**	625	>2017[2]	Under Study (conceptual proposal)	Unlikely	Possibly (depends on if/where this project would tie into Enbridge Mainline system)
Keystone XL Northern Leg (Phase III)	Hardisty	Cushing	**3**	830	2015	Proposed. No approval	Uncertain[3]	**Yes**
WhiteCliffs ExLoop	Plattville, CO	Cushing	**14**	?[4]	-[4]	Under study	Likely	To some extent as route 14 currently limiting Canadian flows through Express from Canada to PADD 4 (route 2 in model)
Pony Express	Guernsey, WY	Cushing	**14**	210	1Q 2014	Proposed. No approval	Unlikely	As above

Source: Wood Mackenzie

› **Modelling notes:**

[1]**Assuming 200 kbd capacity increase between Clearbrook and Mid West (via Superior) - equiv to +15% of capacity south of Superior**

[2]Assume 2020

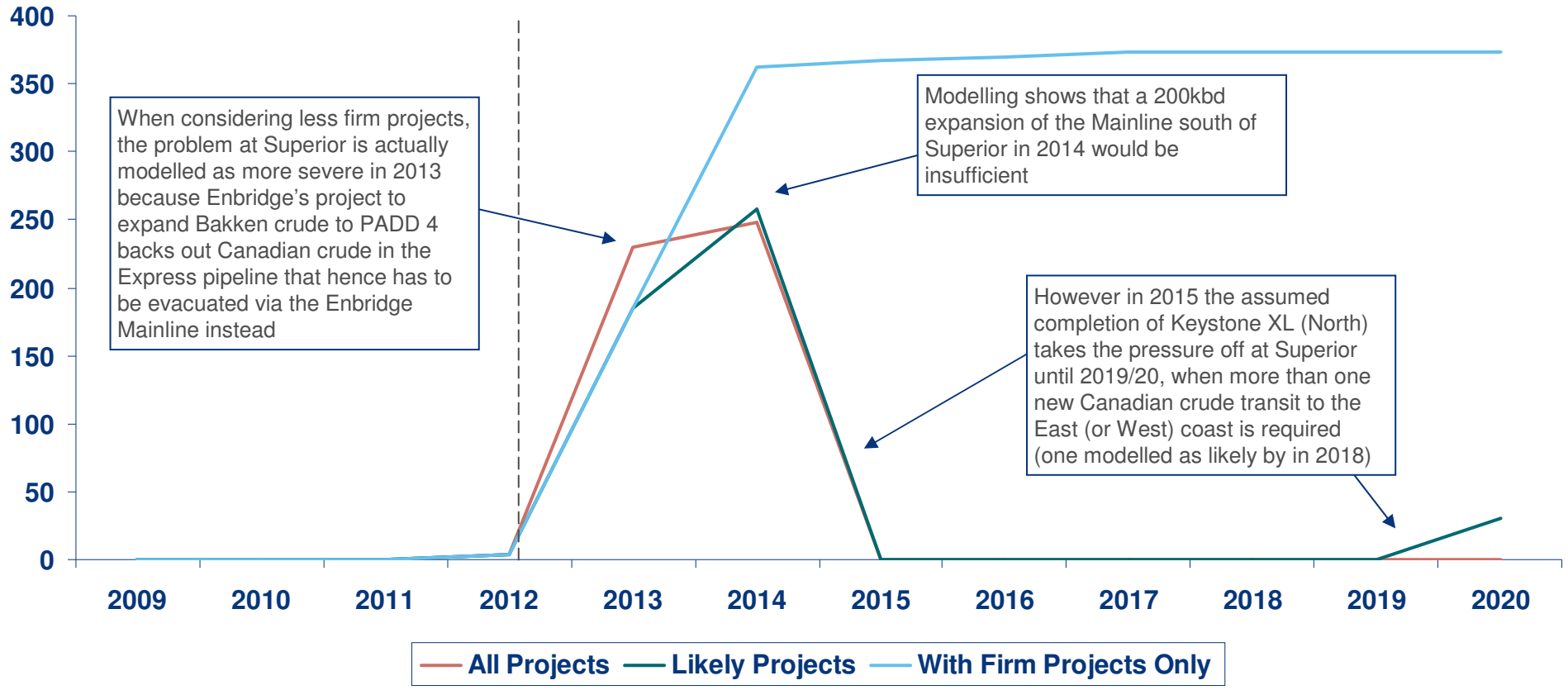
[3]Modelling as "likely"

[4]Assume parallel line run (extra 70kbd) in 2014

[5]Assumption. Wood Mackenzie judges it likely that one of the two proposed Canadian West Coast routes will be implemented by 2020, but not both. For the purposes of modelling we assume Northern Gateway is successful and TME is not.

A bottleneck at Superior should be addressed by projects that are considered likely to go ahead

Modeled and Forecast Enbridge Mainline Pipeline Bottleneck (South of Superior), kbd



Source: Wood Mackenzie

Notes: Development of the surplus at Clearbrook means the downstream surplus at Superior stops growing in 2014.

The outlook is for continued large Edmonton crude prices discounts versus

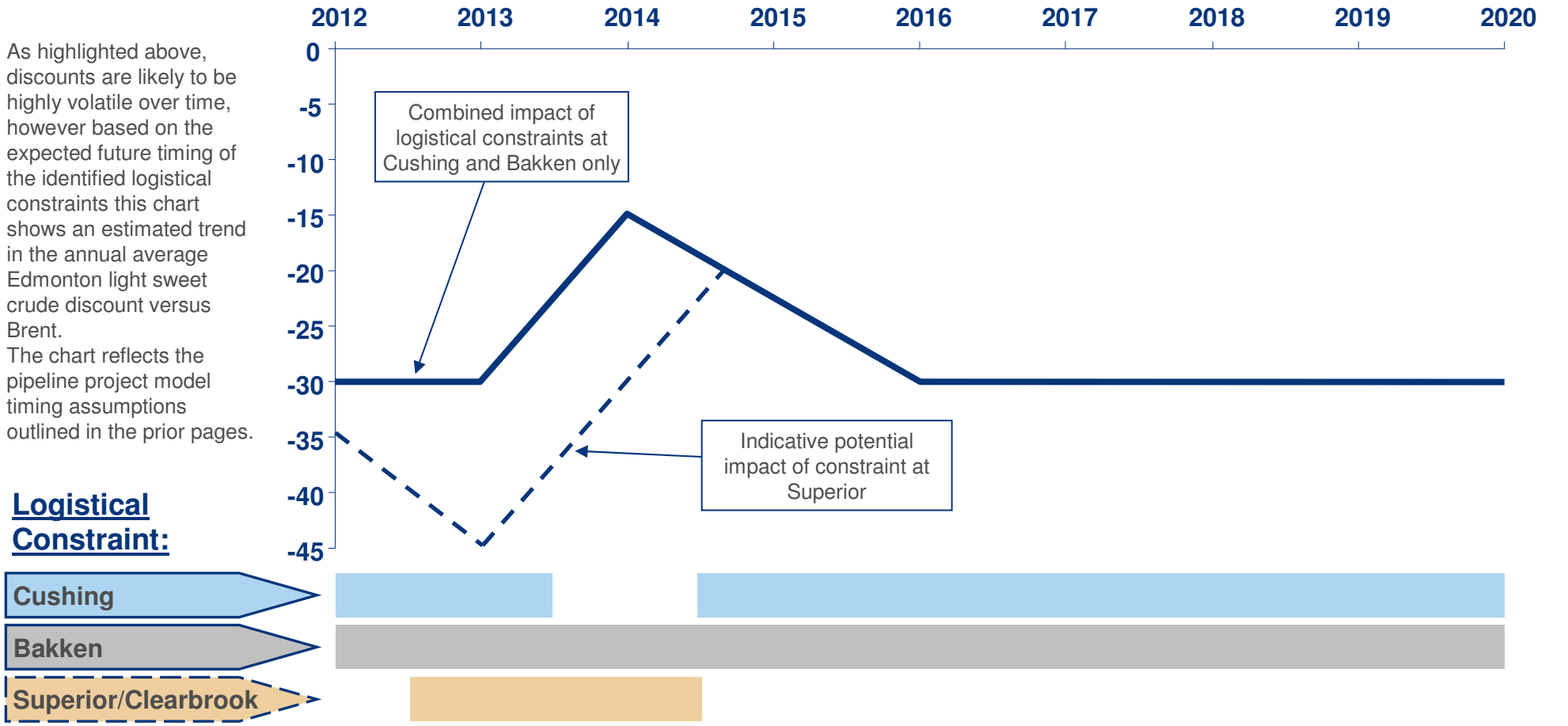
Logistical Constraint	Impact on Edmonton Discount	Timing (all projects implemented)
Cushing surplus over pipeline evacuation capacity	~$15/bbl	Throughout forecast. Short respite ~2014
Bakken surplus over pipeline evacuation capacity	~$15/bbl	Throughout forecast
Superior/Clearbrook pipeline capacity bottleneck	Unknown Not yet evidenced but potentially additive to impact of Bakken above	2013 / 14 particularly severe

- The estimated discounts assume a combination of rail and truck (or barge) – consistent with the large surpluses forecasted at Bakken and Cushing. The values are long term averages and on any given day these can be somewhat lower or significantly higher e.g. due to structural shortages in tank cars or trucks, etc
- The annual average total discount is likely to be at least $20/bbl – except perhaps for a short period after completion of the Keystone XL pipeline from Hardisty to Cushing in the Mid Con – comfortably enough to continue to incentivise US West Coast refiners to utilise TMPL

Source: Wood Mackenzie

Estimated Edmonton Light Sweet Discount vs Brent Assuming No Unannounced Pipeline Projects, $/bbl

As highlighted above, discounts are likely to be highly volatile over time, however based on the expected future timing of the identified logistical constraints this chart shows an estimated trend in the annual average Edmonton light sweet crude discount versus Brent.
The chart reflects the pipeline project model timing assumptions outlined in the prior pages.



The forecasted discounts are considered relatively robust to uncertainties not least because the crude supply response to very low prices would be sluggish

Upstream Shut-in Economics

Unknown Pipeline Projects

Further unannounced pipeline projects could theoretically change the logistical constraints that drive the current and forecasted crude discounts discussed above. However large-scale trans-state or trans-national pipeline projects are needed to do so. The industry has a poor recent track record of quickly implementing such projects. Most projects are being severely hampered by regulatory approval. Environmental concerns are especially strong. Indeed it is Wood Mackenzie's judgement that any new (i.e. currently unannounced) major greenfield pipeline projects are very unlikely to be implementable within a 5 to 8 year timeframe. Brownfield projects such as line expansions or reversals could potentially happen sooner but are also seen to be subject to vocal and determined environmental objections, especially in Canada.

Upstream Fundamentals

Wood Mackenzie analysis estimates that Canadian Oil sands projects (the main source of incremental Canadian supply) have attractive project economics with crude oil prices of between 50 and 75 $/bbl (providing a 10% project ROI). However the marginal economics of an asset in production are much lower: 20 to $40 $/bbl crude will cover variable operating costs. So only an extended period of low international oil prices would cause any major revision to our supply forecasts via cancellation or postponement of Oil Sands investments.
The economics of Bakken developments are more susceptible to shorter term oil prices as the capital expense of such projects is drawn out across the life of the asset/project. Nevertheless it is Wood Mackenzie's opinion that prices below 60 $/bbl here would have to persist for 2 years or more to have a notable supply impact as producers' hedges, and industry momentum, unwind.

International Crude Prices

For prices below $60/bbl to persist in Bakken/Canada for long enough to have an impact, discounts would have to be particularly strong and combine with low international crude (Brent) prices (e.g. $90/bbl or less) for an extended period of time.

Agenda

1	How long and to what extent will the Canadian crude discount persist?
2	What are the alternative sources of crude and transport options for Burnaby?
3	Conclusions

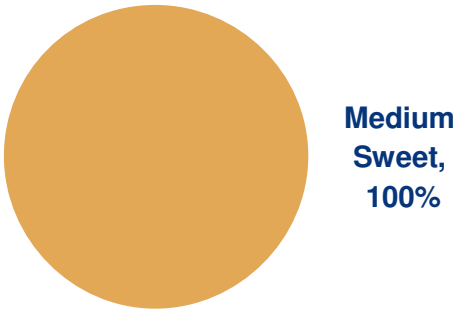
The Burnaby refinery is a refinery in Vancouver that is designed to run a series of Canadian medium and light crudes

Chevron - Burnaby

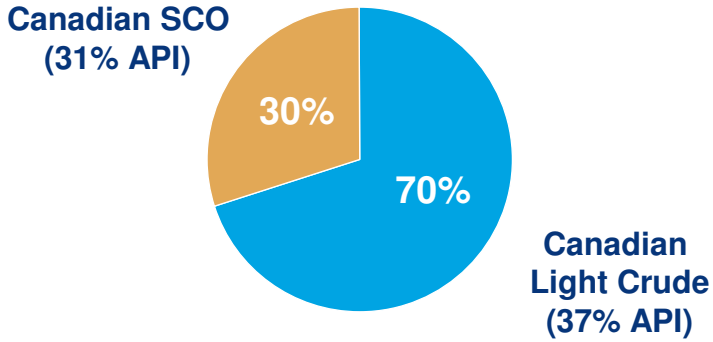
Refinery Unit Capacity	kbd
Atmospheric Crude Distillation	58
Vaccum Crude Distillation	13
Fluid Catalytic Cracking	18
Distillate Hydrocracker	0
Residue Hydrocracking	0
Mild Hydrocracking Unit	0
Fluid or Delayed Coker	0
Semi-Regenerative Reforming	12
Continuous Catalytic Reformer	0
Alkylation	3
Isomerization	11
C4 Isomerization	0
Polymerization	1
BTX	0
Solvent Deasphalting	0
Bitumen	2
Distillate Hydrotreater	16
Naphtha Hydrotreating	15
Wood Mackenzie Complexity Index	6.1
Nelson Complexity	9.1

Crude Slate by Quality (API gravity*)

Wt. Average Crude	
Avg API	**34.5**
Avg Sulfur	**0.4**

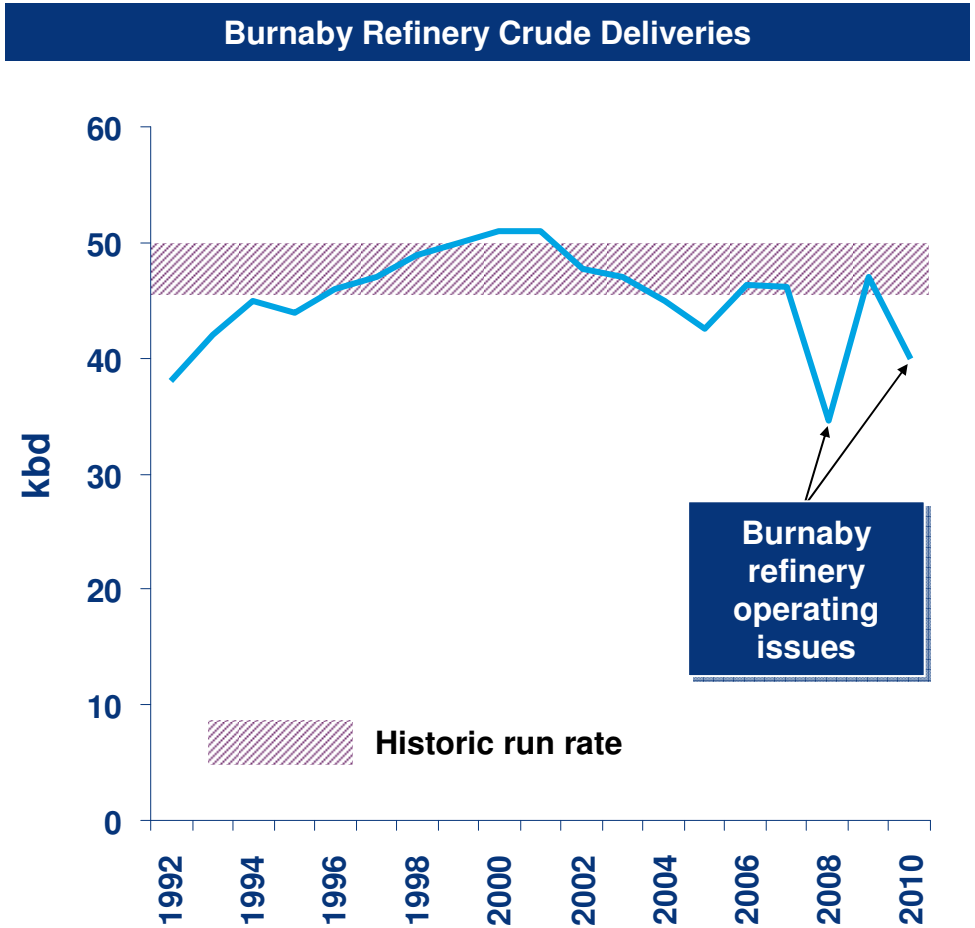


Crude Slate by Stream Name



Source: Wood Mackenzie – Refinery Evaluation Model
**Note: (1) API gravity categorized as: Light (> 38 API); Medium (38> API >30); Heavy (30 > API > 15)*

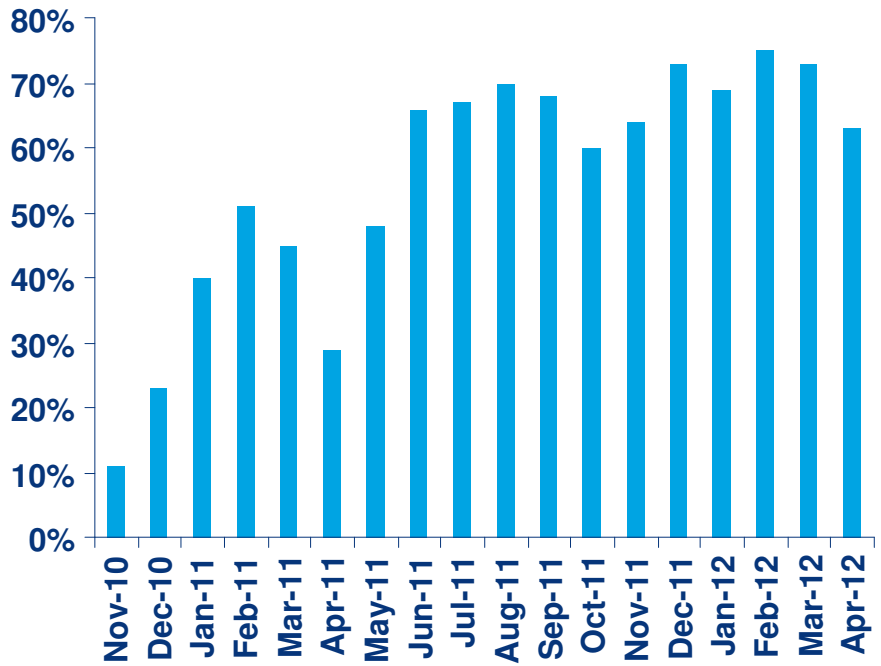
These Canadian crude deliveries have averaged 45-50 KBD and have been delivered exclusively by the TMPL for a number of years



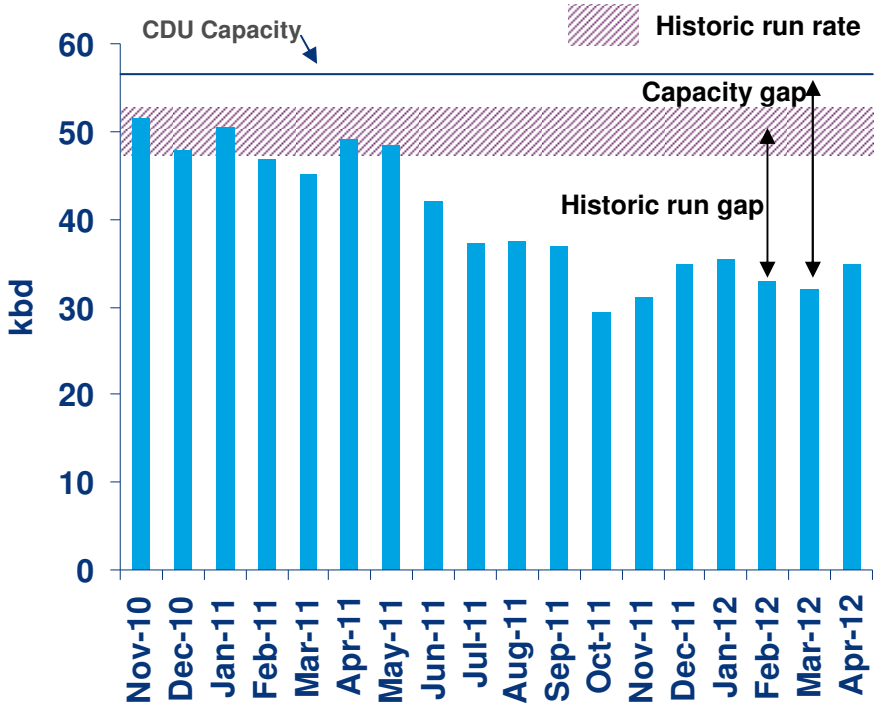
- Crude deliveries in the past have been exclusively from the Trans Mountain pipeline
- Historically, with exception of 2008 and 2010 when the refinery experienced operating problems, the refinery has run 45-50 KBD of crude
  - Current ability to run over 55 KBP of the crude slate, with economic and technical incentive to maximize processing volume
- This excludes and is in addition to "trans-mix" (transition material between batches in the pipeline) and other feedstocks which Chevron feeds to the refinery

As the crude discount in Canada has widened cause by the infrastructure constraints starting in late 2010, apportionment in the TMPL has increased and deliveries from nominations to Burnaby have suffered

TMPL Apportionment



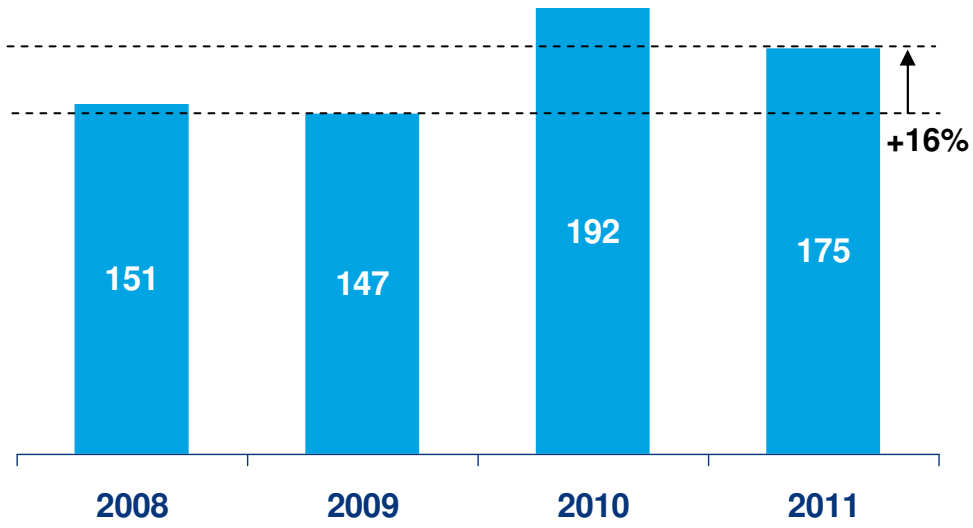
TMPL Crude from Nominations for the Burnaby Refinery



Apportionment has resulted in Burnaby crude deliveries from nominations to Burnaby through the TMPL falling significantly short of operating needs.

The apportionment in Burnaby has come at a time when pipeline exports to PADD V refineries have increased by over 25KBD on average

Crude Exports to PADD V from Canada (KBD)

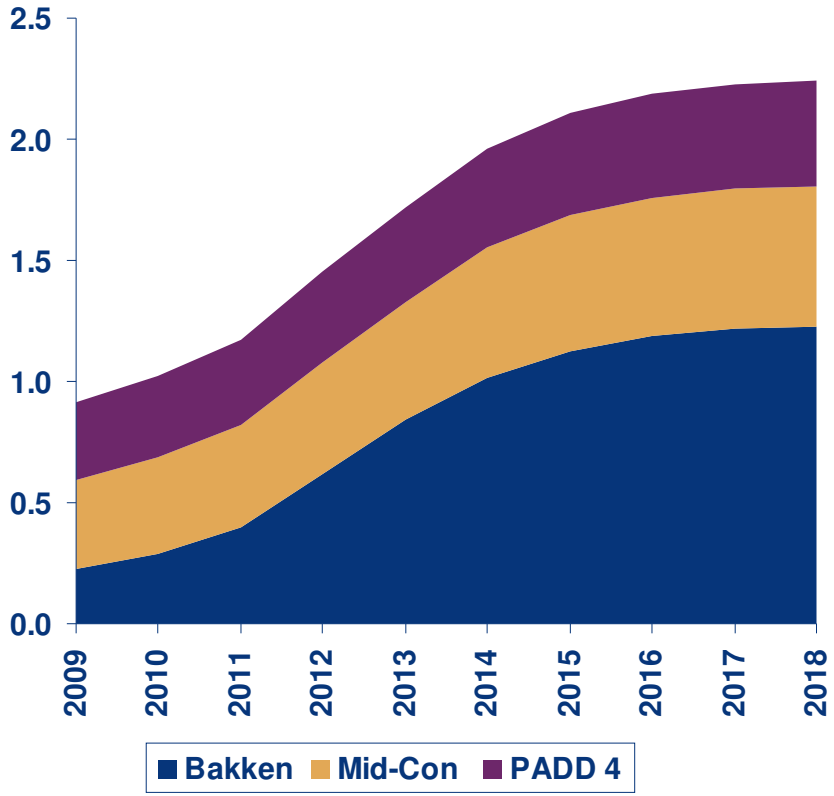


Source: Wood Mackenzie Analysis, EIA Data

- **Exports by pipe are concentrated in four major Washington State refineries**
  - Tesoro (Anacortes) – 48 kbd in 2011
  - Shell (Puget Sound) – 46 kbd
  - BP (Cherry Point) – 30 kbd
  - ConocoPhillips (Ferndale) – 16 kbd
- **These account for 130 of the 143 kbd of crudes delivered by pipeline to USWC. Waterborne deliveries to certain California-based refineries accounted for the incremental 30 kbd of exports to USWC in 2011**
- **This volume includes Canadian heavy crude volumes which compete for space on the TMPL with the lighter crudes, SCO and products**
- **Adjusting for Burnaby outages in 2010, the USWC refineries called on an additional 25 kbd of crude capacity on TMPL since the discontinuity occurred. Coincidentally, the level that Burnaby remains short in crude delivery from nominations to Burnaby**

Two significant crude sources are suitable for processing at Burnaby. US Mid Con crudes are favorable, but authority to import these crudes into Canada is unlikely to be granted

US Mid Con Light Sweet Crudes

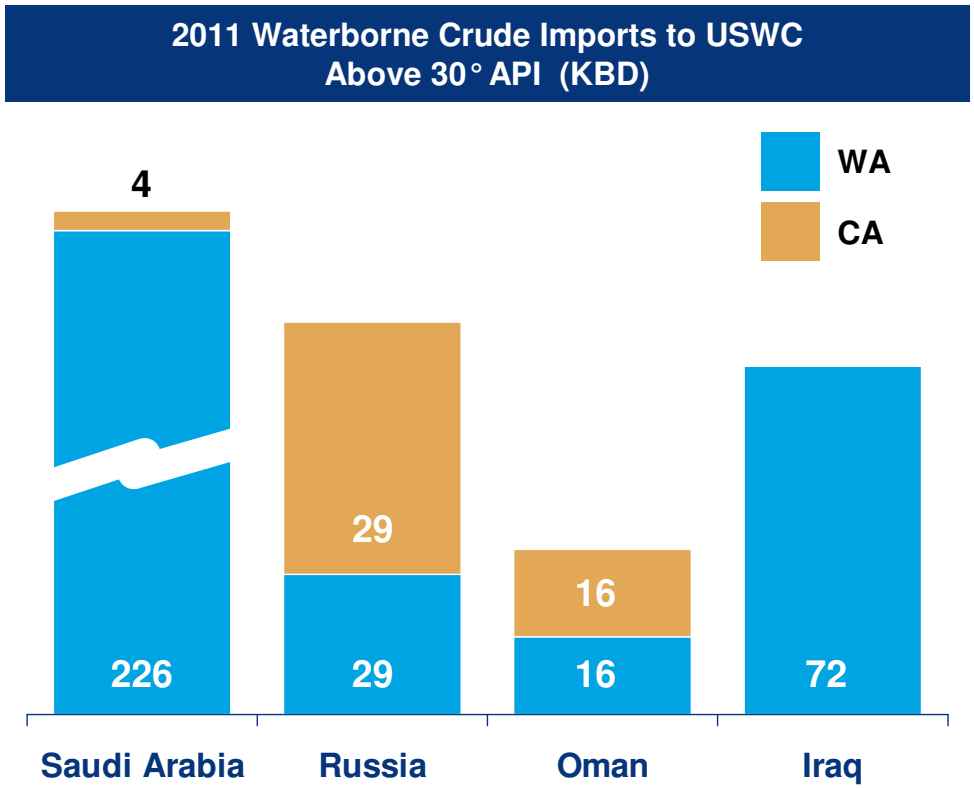


Source: Wood Mackenzie Analysis

- **US Mid Continent crudes are proper gravity and located in a favorable producing region**
  - Washington state refiners (e.g., Tesoro) are making plans and implementing strategies to deliver advantaged crudes to their facilities
- **US Export rules will not likely allow for the delivery of these crudes to Burnaby**
  - **Under the Code of Federal Regulations**
    - Title 15: Commerce and Foreign Trade
    - Subtitle B: Chapter VII: Bureau of Industry and Security
    - Subchapter C: Export Admin. Regulation
    - Part 754.2: Short Supply Controls – Crude Oil

    the government reserves the right to explicitly approve exports from the US. Historically, that has only been granted to ANS crudes sourced in Alaska and certain crudes delivered to Sarnia, Ontario
  - **While paragraph (e) of this section suggests that exports to Canada will generally be treated favorably, US surety of supply concerns make this highly uncertain and there are very few precedents of exports of crude oil from the continental US ever being permitted**

As a second crude source, suitable waterborne crudes on the USWC would need to be sourced from either Russia or Saudi Arabia to fill Burnaby volumes



- All lighter crudes available to the USWC are long haul crudes, generally arriving on VLCC type tankers
- With the exception of a significant level of Russian crude being delivered to BP and Tesoro refineries, the bulk of these crudes are delivered to the California refineries
- In the absence of infrastructure constraints, Russian, Saudi Arabian and Iraqi crudes may be an option for Burnaby but would likely require a split cargo
- Price of wateborne crude will be at world standards without Canadian crude discount, adding over $15/bbl under all scenarios

The net result is that Burnaby has two sources of incremental crude to analyze

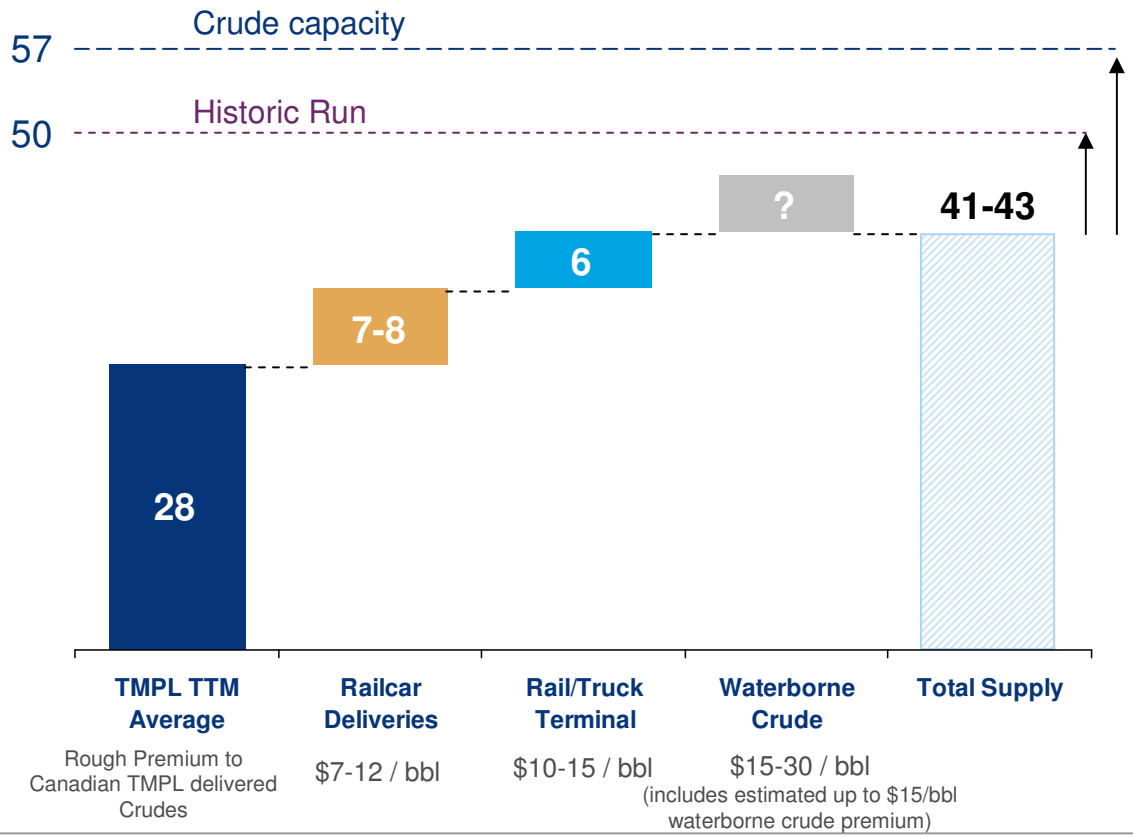
- ***Incremental volumes of Canadian crude delivered via alternate means to the TMPL***
- ***Waterborne crudes from long-haul origins***

At current apportionment and pricing situations, Burnaby needs to either bring in additional Canadian crudes outside of TMPL or source long-haul crudes for waterborne delivery

	Macro Environment Issues	Burnaby Specific Issues
Train/unit train from Edmonton to Refinery	▪ Trains and unit trains for delivering North American crudes are in heavy demand, primarily to run southbound. ▪ Railcars are limited. ▪ Significant cost above current pipeline cost (rises from less than $3/bbl to up to $15/bbl depending on railcar back-haul economics)	▪ Unit unloading facilities do not exist. ▪ Backfill opportunity for site with 12-14 berths (per Chevron information) could add 7-8 kbd of delivery ▪ Chevron estimates capex requirement of over $6 MM and best in service date of 1Q 2013
Combination Train/Truck or straight truck crude from Edmonton	▪ Train/ railcar access is limited as above. ▪ Cost is high as above, with an incremental cost of up to $3/bbl of crude to account for trucking portion of the route	▪ Limited capacity constructed as of May 2012. ▪ Capex (Chevron estimates) of $2.2 – $2.4 MM. ▪ Retrofit undertaken to build one truck per hour unloading facility capable of up to 6 KBD.
Bring in waterborne crudes	▪ Long haul crude available to be delivered in VLCC or other very large tanker (e.g. Russia, Saudi Arabia, Oman) most likely through a lightering process ▪ Delivery, lightering and demurrage costs would be high ▪ Likely need to share cargos with other facilities	▪ No dock capability for unloading larger ships. ▪ No permitting in place to build necessary infrastructure. ▪ Volumes needed at Burnaby mismatched to ship delivery size requiring shared tanker with other facilities

The net is that without significantly more volume from TMPL, Burnaby has no way to secure needed crude volumes in the short to medium term

Estimated Short/Medium Term Crude Supply for Burnaby Allocation and Investment Options



- **Even with medium term rail and truck/rail investment, the refinery will need only receive approximately 75% of nameplate capacity from Burnaby's allocation of crude**
- **Incremental crude costs for the last third of volume will be significantly above TMPL deliveries (assumes roughly $3/bbl pipeline costs) in addition to spare capacity**
- **Longer term there are sufficient challenges and costs associated with preparing Burnaby to receive crude via waterborne route**
  - Permitting for major deliveries
  - Expense of dock improvements
  - Ongoing lightering costs
  - Inability to access advantaged crudes
- **Little likelihood that US will allow cost advantaged Bakken crude to Burnaby due to export restrictions**

Agenda

1	How long and to what extent will the Canadian crude discount persist?
2	What are the alternative sources of crude and transport options for Burnaby?
3	Conclusions

Conclusions: Apportionment of TMPL volumes is likely to continue and the Burnaby refinery, with no other options, will hence be unable to receive sufficient feedstock to maintain normal operations

How long and to what extent is the present discount of Canadian Crude oil relative to world oil prices likely to persist?

- The price discounts for Canadian crude initially developed in conjunction with the well-publicised WTI discounts to Brent driven by a newly emerged surplus of crude in the Mid Con combined with a lack of infrastructure to evacuate it cheaply
- The additional large Canadian discounts in recent months are due to capacity constraints in the North: chiefly the US Bakken, but probably exasperated by an emerging bottleneck in Canadian pipeline export capacity
- Pipeline projects do not keep up with structural excesses at either Cushing (except briefly when the Keystone XL pipeline from Cushing to the Gulf Coast is built ~2014) or the Bakken
- Even completion of pipeline projects that are under study or simply rumoured does not add sufficient capacity to keep up with structural supply excesses
- Edmonton crude price discounts versus Brent will therefore continue, typically at over $20/bbl for light sweet Canadian grades and higher more for heavier crude oil grades
- A major bottleneck on Enbridge's Mainline at Superior seems likely to be reached, creating volatility in the short-term and potentially adding to Canadian discounts if it is not resolved in the medium term
- It hence seems very likely that apportionment of TMPL volumes will remain

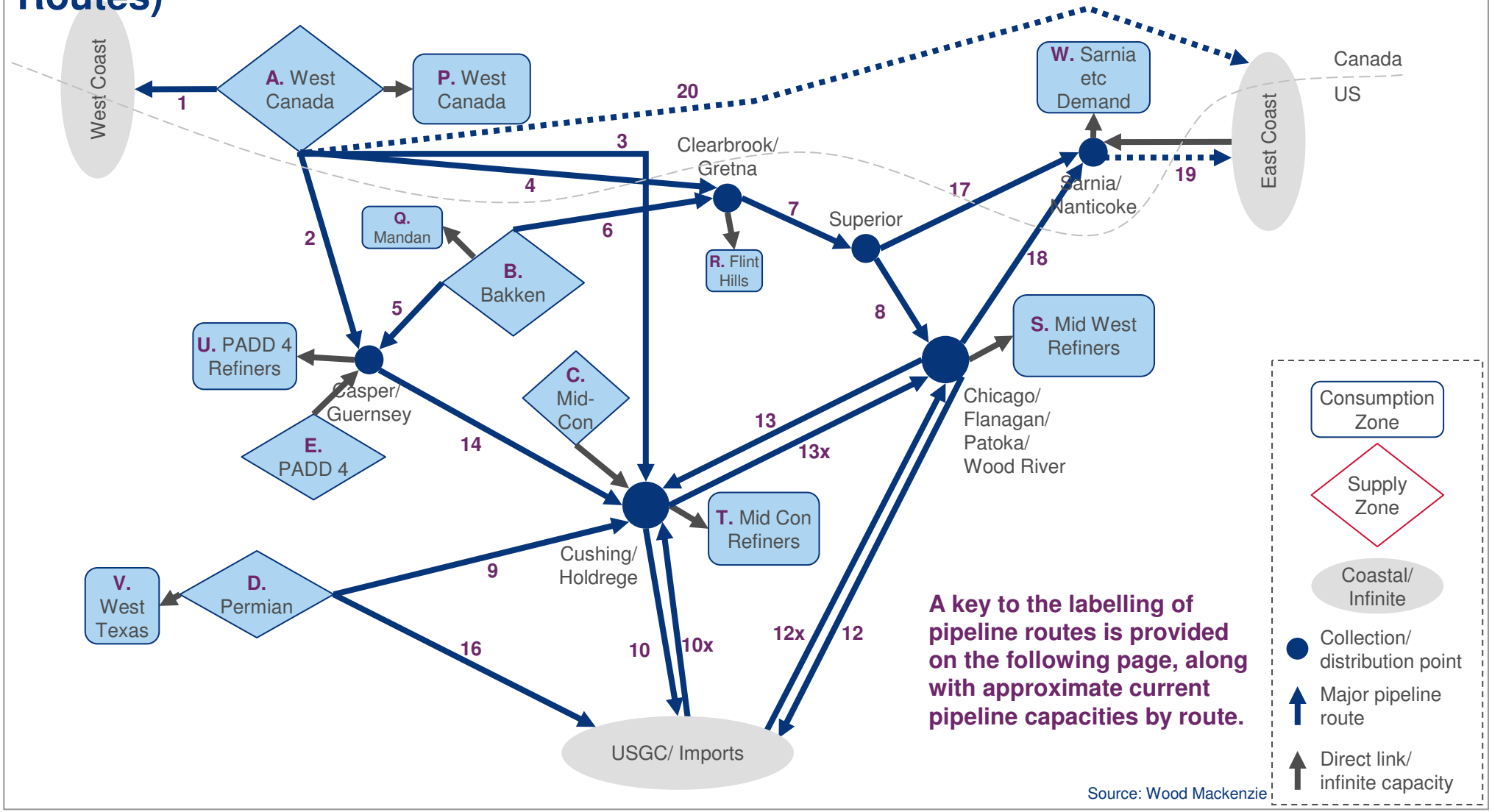
What are the alternative sources of crude oil and the modes of transportation for delivery to the Burnaby refinery?

- The Alberta discounts are driving very attractive economics for US West Coast refiners who can obtain crude via the TMPL and so forcing apportionment on the pipeline
- Other sources of crude oil are probably unavailable to Burnaby due to very tight restrictions on export from the US and a current lack of facilities (either to accept water-borne imports from other countries or significant volumes from in-land sources)
- Investment options to facilitate receipt of Canadian crudes by rail or truck do not allow the Burnaby refinery to source sufficient volumes to fill the refinery if TMPL apportionment is as severe as the recent past

Agenda

Appendices

NA Crude Logistics: Simplified Basis for Modelling (Including Proposed New Routes)



Source: Wood Mackenzie

Gulf Coast includes Eagle Ford and other non-Permian volumes linked to Gulf Coast.
Utica/Marcellus included in East Coast.
Mid West includes St Paul Northern Tier refinery.
W. Texas includes Borger and McKee, but Cushing fees ~40kbd to Borger

NA Crude Logistics: Simplified Basis for Modelling – Model Labels

Current Major Pipelines	Route Label	Approx. Current Total Route Capacity, kbd
TMPL	1	300
Express, Milk River, Rangeland	2	483
Keystone	3	591
Enbridge Mainline 1, 2, 3, 4, 67, 65	4	2500
Belle Fourche, Butte	5	168
Enbridge	6	185
Enbridge Mainline 1, 2, 3, 4, 67	7	2315
Enbridge line 61	8	1327
Centurion, Basin	9	800
Seaway (post-reversal in May 2012)	10	150
Seaway (now reversed so no longer available)	10x	0
Pegasus	12	96
Capline, Mid Valley	12x	1438
Spearhead (line 55)	13	193
BP (100 to 175?), Ozark, Platte, Keystone 1	13x	970
Platte, White Cliffs	14	215
WTG	16	85
Enbridge line 5	17	491
Enbridge line 6b	18	231

Supply Zone	Label
West Canada	A
Bakken	B
Mid-Con	C
Permian	D
PADD 4	E

Demand Zone	Label
West Canada	P
NW	Q
Flint Hills	R
Mid West	S
Mid Con	T
PADD 4	U
W Texas	V
Sarnia, etc	W

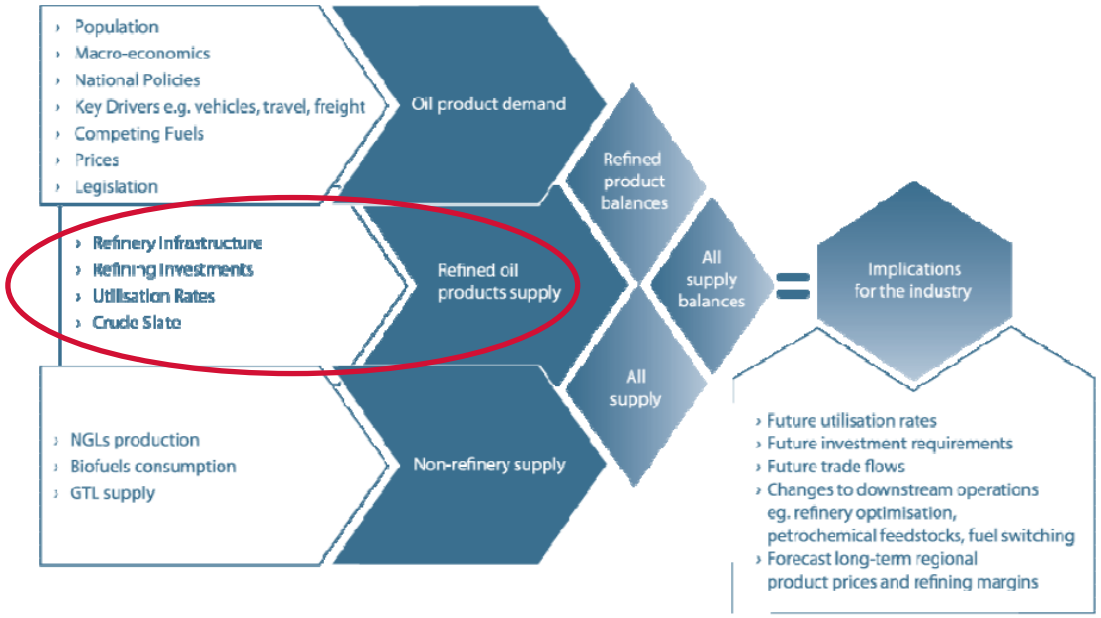
Source: Wood Mackenzie

Crude oil supply forecast methodology

- Crude oil supply forecasts for the logistics model are taken from Wood Mackenzie's established, highly developed and unrivalled upstream research services.
- **Upstream Service Methodology – Reserves and Production**
- In the Upstream Service Wood Mackenzie's estimates of oil and gas reserves and production are based on our view of likely future production. Note that Wood Mackenzie does not conduct independent reservoir studies or engineering assessments. Rather, we make an independent analysis of production forecasts provided by operators and/or partners (where available), integrated with our own view of other commercial factors such as demand, infrastructural availability, costs etc. We validate this assessment by comparing this to data from analogous fields in the same basin or region.
- Our estimates are broadly equivalent to company proved plus probable (p + p or 2p) reserve and production estimates. We take this approach, as opposed to basing asset modelling on a proved (1p) reserves basis, because the 2p reserve case is believed to represent the 'most likely' future outcome for each asset. For those assets where reserve upside is known to exist, for example where isolated sections of a reservoir have yet to be drilled, this will be noted in the text (such reserves are usually classified as 'possible' or 3p reserves by the companies). Any forecast costs and resultant reserves/production profiles associated with these 3p reserves will not however be included in our cash flow analysis.
- Wood Mackenzie's reserve estimates cover all those fields regarded as commercial: fields in production or under development as well as fields which Wood Mackenzie classes as 'Probable Developments' (see 'Classification of Discoveries' section). It should be noted that in many cases Wood Mackenzie will class a discovery as a Probable Development before a company has booked the reserves under the applicable stock exchange rules, for example the SEC in the US. In light of this, and the fact that SEC/annual report figures generally report proved (1p) reserves, Wood Mackenzie's published entitlement reserves are likely to exceed SEC reported reserves.

Crude oil demand forecast methodology

- Our Product Market Services provides a long-term view of the oil product market out to 2025 by building up a global/regional picture through our in-depth analysis at a country level. Our analysis is based on historical data provided by the IEA, supported by local statistics. Our forecasts are done in-house, using proprietary models, and are based on certain macroeconomic assumptions which are shown in the diagram below.



- The crude oil demand in refineries – used in the logistics model in this study – is based on our work to forecast refined product supply. Specifically it is determined by refinery infrastructure and projects, plus our utilisation assumptions
- Future utilisation rates are determined in an iterative process considering local, national, regional and global product markets, refinery asset competitive positioning, refinery investments and capacity creep. All of which are independently assessed by Wood Mackenzie as part of this broader analysis

Pipeline Project Status (1/2)

Pipeline/Project	Operator	From	To	Route Label	kbd	Assessed Status	Likelihood*	Likelihood Comments
Enbridge Bakken Expansion US	Enbridge	Beaver Lodge, ND	Cromer, Manitoba	6	120	Under construction	Firm	Under construction.
Mainline	Enbridge	-	-	7,8	?	Under Study.	Likely	Company stated it recognises need to ensure space for new Bakken volumes exists in mainline, is examining options and will make announcement expected in May.
TransMountain Expansion/Twinning	Kinder Morgan	Edmonton	Vancouver/Kitimat	1	550	Proposed. No approval	Unlikely**	Competing East coast pipeline project entered in regulatory process earlier. Surprisingly large environmental objections (despite following existing pipeline route).
Northern Gateway Pipeline	Enbridge	Bruderheim AB	Kitimat, BC	1	520	Proposed. No approval	Likely**	Actively seeking regulatory approval, although process is slow.
Line 9 Reversal to Montreal	Enbridge	Sarnia, ON	Montreal, QC	19	200	Under study	Likely	Pipeline reversal: typically cheaper and less difficult regulatory process than greenfield pipeline.
Portland to Montreal Pipeline Reversal	PMPL	Montreal QC	Portland, ME	19	200	Rumoured	Unlikely	Company states not currently under serious consideration/study.
New Pipeline	TransCanada	Alberta	Montreal / East Coast	20	625	Under Study	Unlikely	No firm plans or proposals. One option may be to convert a gas pipeline but details are sparse.
Seaway Reversal	Enbridge/ Enterprise	Cushing	Freeport	10/10x	150/ 400	Completed	Firm	Completed May 2012.
Seaway Loop Expansion	Enbridge/ Enterprise	Cushing	Freeport	10	400	Proposed. No approval	Likely	Existing pipeline route, "friendly" regulatory environment. Ties in with Flanagan South + Alberta Clipper expansion.
Keystone XL USGC Project (Phase IV)	TransCanada	Cushing	Port Arthur	10	830	Proposed. Approval	Firm	Presidential approval obtained for southern leg.
Keystone XL Northern Leg (Phase III)	TransCanada	Hardisty	Cushing	3	830	Proposed. No approval	Uncertain	Presidential influence hence dependant on outcome of 2012 elections.
Alberta Clipper Expansion	Enbridge	Hardisty	Superior, WI	4, 7	350	Under study	Likely	Ties in with Flanagan South + Seaway expansion.
WhiteCliffs ExLoop	Semgroup	Plattville, CO	Cushing	14	-	Under study	Likely	New pipeline.
Basin Pipeline Expansion	PAA	-	Cushing	14	50	Under construction	Firm	Under construction (may be complete at time of writing).
Enbridge Line 5 Expansion	Enbridge	Superior, WI	Sarnia, ON	9	50	(Likely) Under construction	Firm	Small expansion that is discussed firmly by Enbridge (may be under construction).

*Qualitative assessment: likelihood of going ahead within next 5 years or so.
**Assumption. Wood Mackenzie judges it likely that one of the two proposed Canadian West Coast routes will be implemented by 2020, but not both. For the purposes of modelling we assume Northern Gateway is successful and TME is not.

Pipeline Project Status (1/2)

Pipeline/Project	Operator	From	To	Route Label	kbd	Assessed Status	Likelihood*	Likelihood Comments
Saddle Butte Pipeline	High Prarie	Alexander, ND	Clearbrook, MN	6	150	Proposed. No approval	Unlikely	New pipeline.
Pony Express	Kinder Morgan	Guernsey, WY	Cushing	14	210	Proposed. No approval	Unlikely	Reuses gas pipeline but also needs 210 mile greenfield extension.
Gulf Coast Access Flanagan South	Enbridge	Flanagan, IL	Cushing	13	585	Proposed. No approval	Likely	Ties in with Seaway expansion + Alberta Clipper expansion.
Longhorn Reversal	Magellan	Crane, TX	Houston	16	225	Proposed. No approval	Likely	After successful open season, company expanded scope. Reversal of product pipeline suggests simple project.
New Pipeline	Magellan	LaSalle, Texas	Corpus Christi, Texas	16	-	(Likely) Abandoned	Unlikely	New pipeline. Proposed in March 2011, but no more news since.
West Texas - Houston Access	Sunoco	Midland	Houston	16	40	Complete	Firm	Completed.
West Texas - Nederland Access	Sunoco	Midland	Nederland, Texas	16	30	Proposed. No approval	Likely	Awaiting update following open season April 2012.
West Texas - Longview Access	Sunoco	Midland	Longview, Texas	9	30	Proposed. No approval	Unlikely	Routes material to Mid Con then Mid West, i.e. counter to expected crude flows and pricing.
Wrangler	Enterprise/ Enbridge	Cushing	USGC	10	800	Abandoned	Unlikely	Enbridge now progressing Texas Access Flanagan South/Seaway/Alberta Clipper.
Texas Access	Enbridge/ ExxonMobil	Patoka	Beaumont	12	400	Abandoned	Unlikely	Enbridge now progressing Texas Access Flanagan South/Seaway/Alberta Clipper.
Butte Loop	-	Baker, ND	Casper, WY	5	50	Rumoured	Unlikely	No firm reports/announcements.
Plains Bakken North	PAA	Trenton, ND	Regina, SK	6	70	(Likely) Abandoned	Unlikely	Concept suggested by company in 2010, but very little coverage or comment since.
Magellan Products Reversal	Magellan	Unknown	USGC	10	70	Rumoured.	Unlikely	No firm reports/announcements.
Bakken Crude Express	ONEOK Partners LP	Williston Basin, ND	Cushing, OK	5,14	200	Proposed. No approval	Likely	Majority of route follows existing ONEOK pipelines.

*Qualitative assessment: likelihood of going ahead within next 5 years or so.

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