

# *Western Canadian Crude Oil Production – an Overview*

Presentation to the  
Crude Oil Quality Group  
Houston, TX Meeting  
May 25, 2006



Crude Quality Inc.

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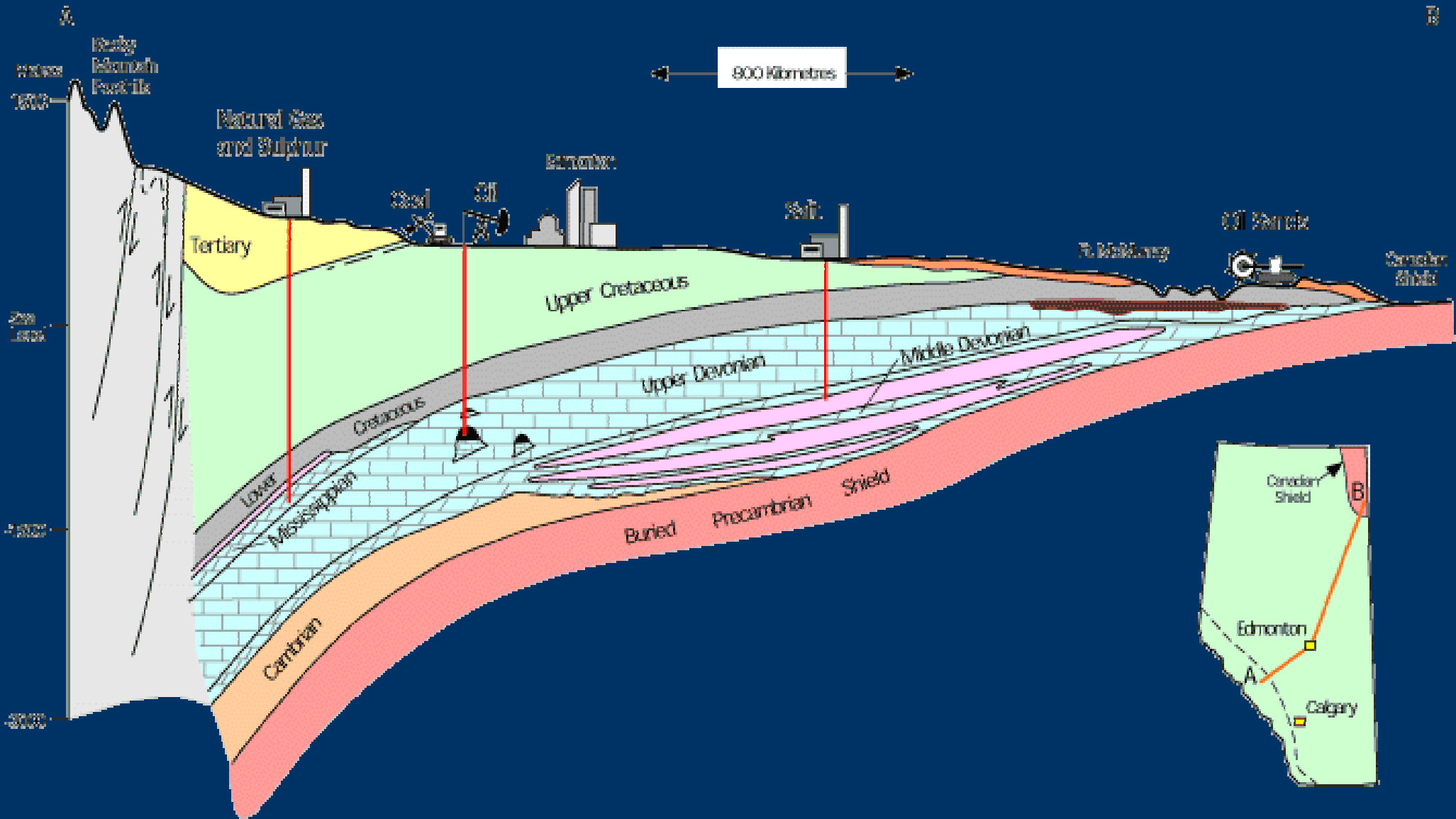
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# *Principal Geology*

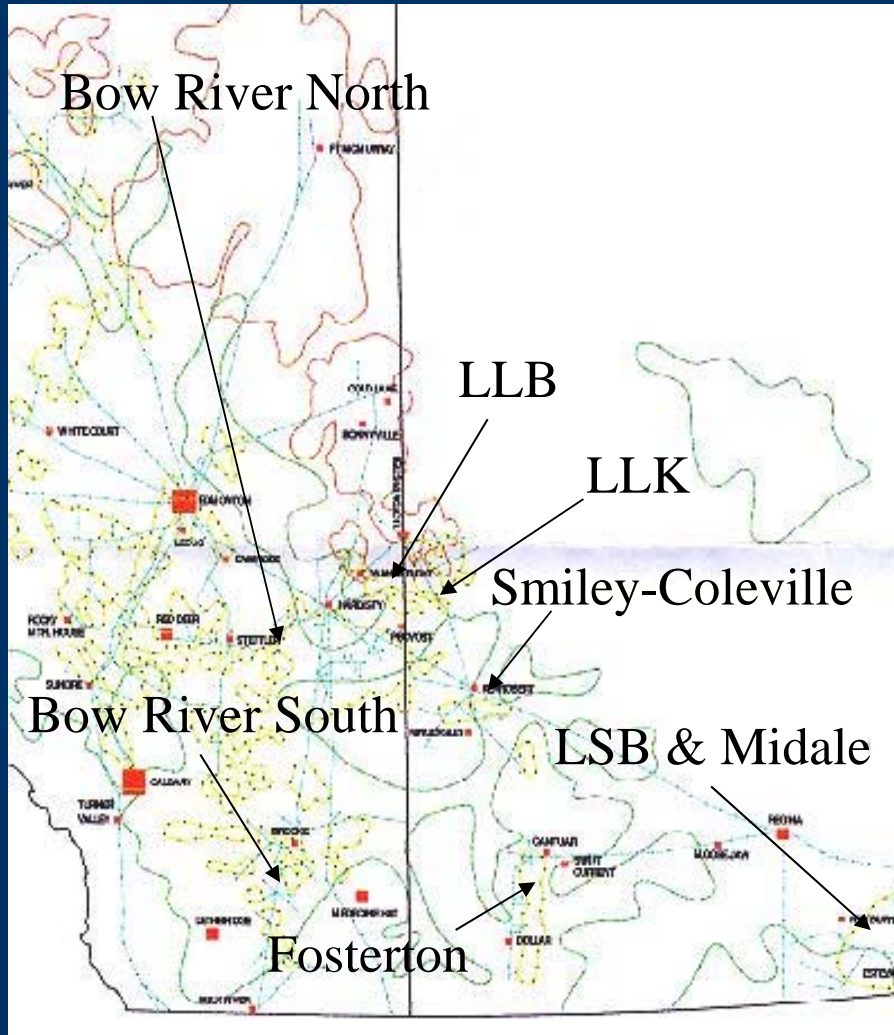
- Predominant Geology
  - PreCambrian Shield
  - Rockies, et al thrust zones
  - Western Canadian Sedimentary Basin (WCSB)
- Four Provinces, two territories
  - All have hydrocarbon reserves



# Alberta – Subterranean Cross Section

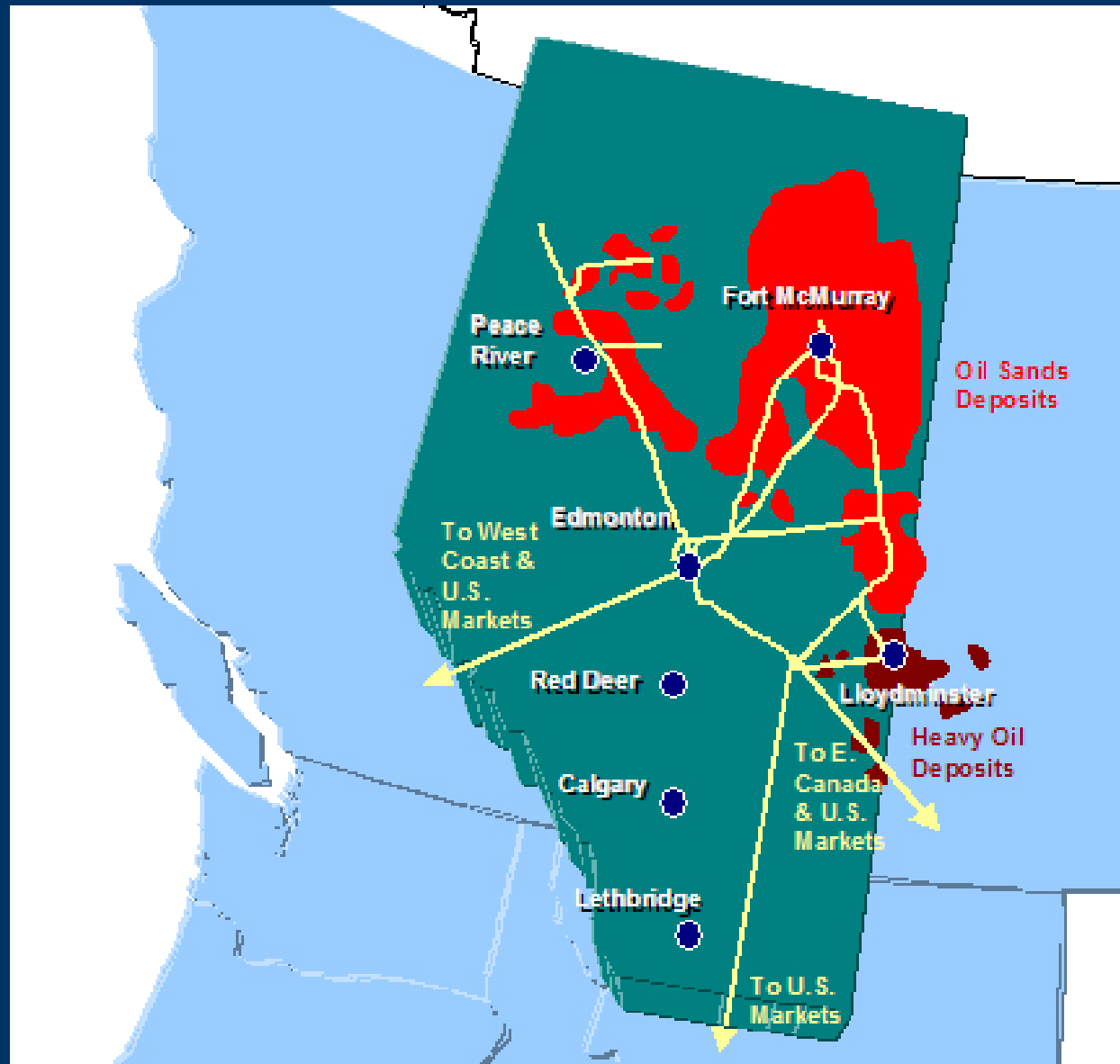


# Western Canadian Sedimentary Basin (WCSB)



- Bitumen regions
  - Cold Lake
  - Athabasca
  - Wabasca
  - Peace River
- Heavy conventional
- Medium conventional
- Light conventional

# Heavy Oil & Oil Sands – Locations



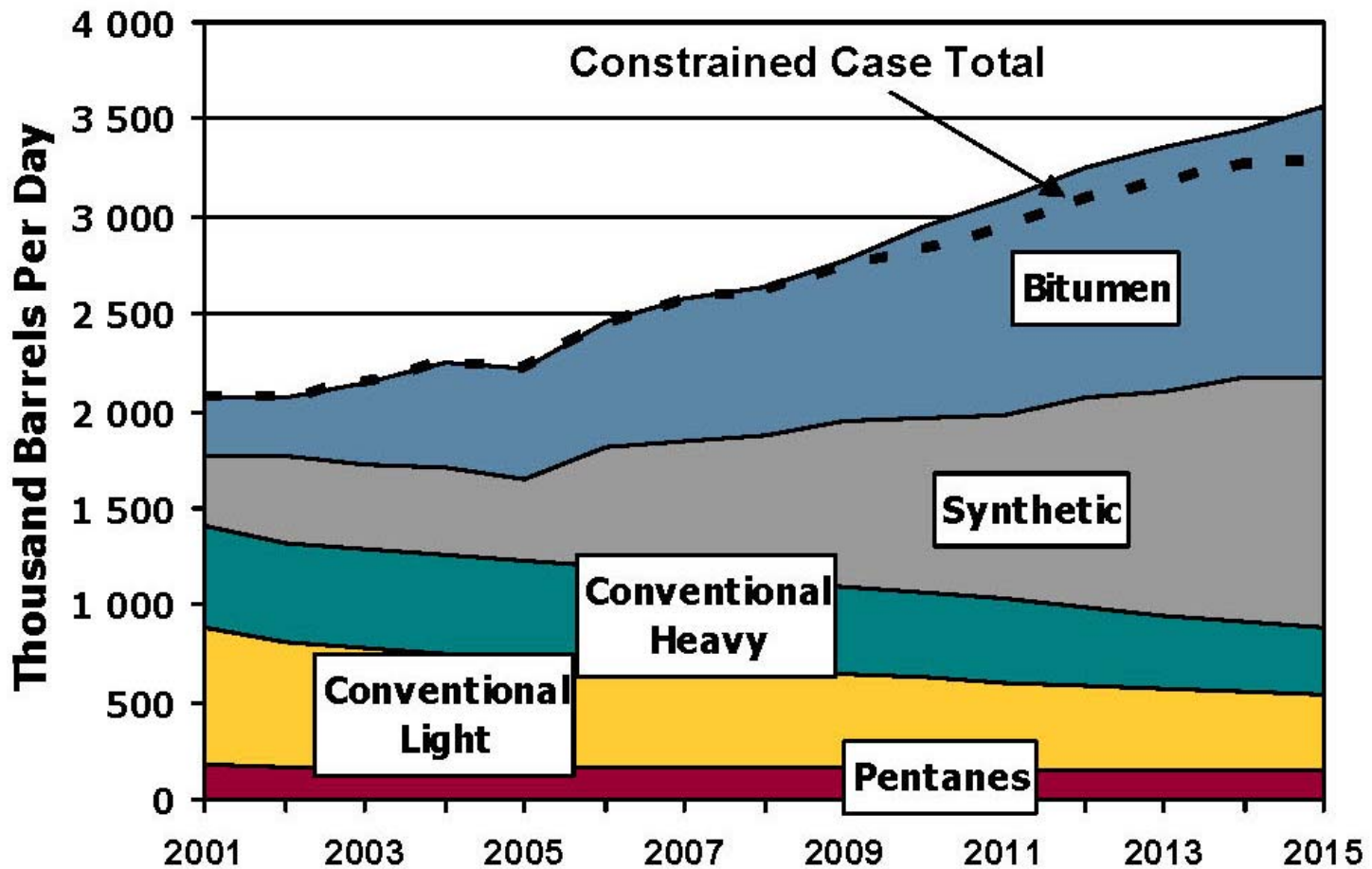
# Key Producers

## Western Canada Production (kbpd)

	BC	AB	SK	MB	NWT	Total
1996	46	1 557	361	11	30	2 004
1997	53	1 620	404	11	29	2 117
1998	57	1 632	399	11	28	2 128
1999	50	1 536	374	10	28	1 999
2000	55	1 537	417	11	26	2 047
2001	55	1 550	427	11	26	2 070
2002	53	1 550	422	11	25	2 061
2003	49	1 643	420	11	24	2 147
2004	47	1 741	423	11	23	2 245
2005 est YTD	42	1 712	421	12	20	2 208
2006 est YTD	46	2 030	477	13	23	2 589

# WCSB Production Estimates

Chart 5: Western Canadian Crude Oil Production  
Moderate Case vs. Constrained Case



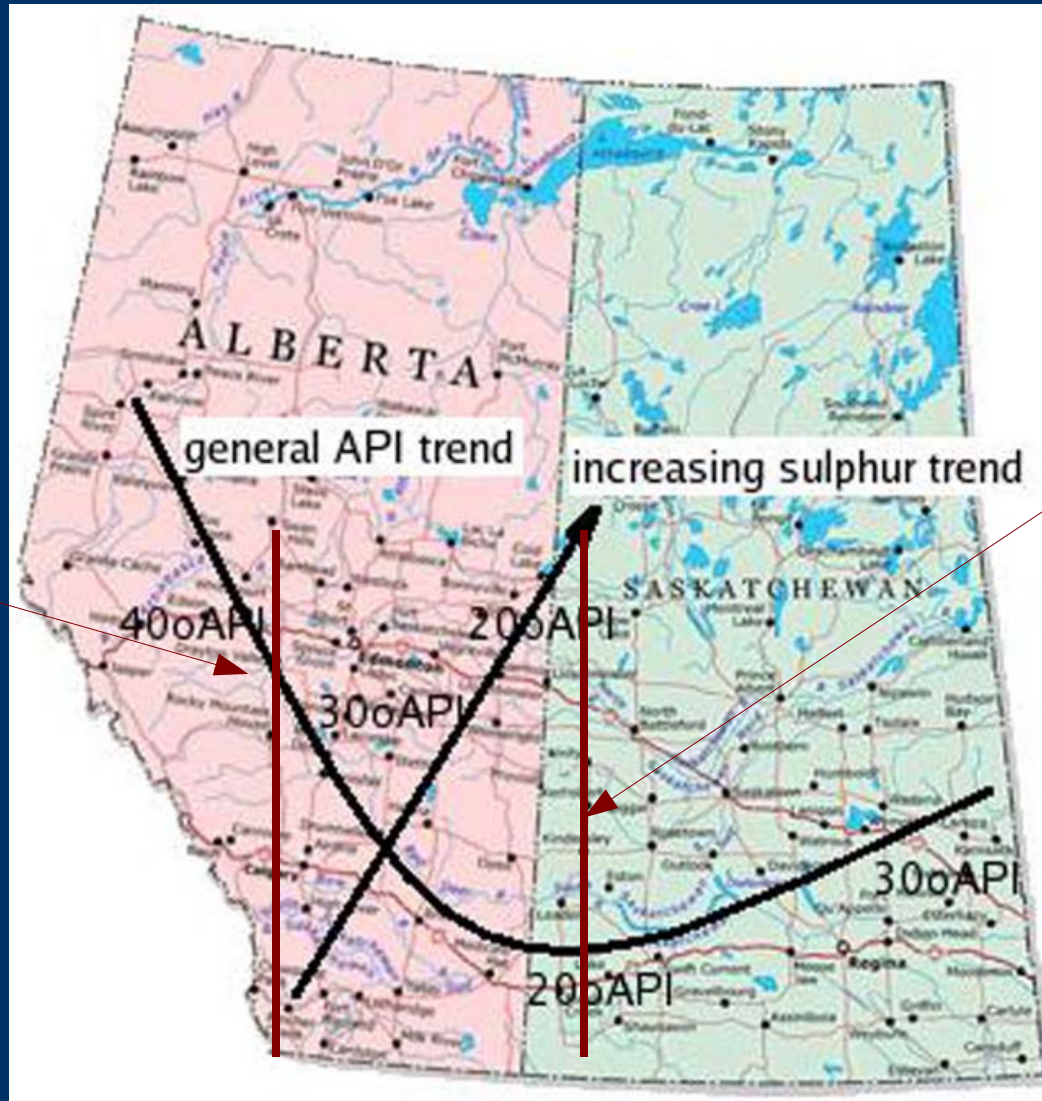
# *Production Techniques*

- Conventional
    - Natural gas, light, medium, heavy crudes
    - Traditional drill a hole, mount a pump (if needed), connect a pipeline to a battery methodology
  - Non-conventional
    - Cyclic Steam Stimulation (CSS)
    - Steam Assisted Gravity Drainage (SAGD)
    - Vapour Extraction (VapEx)
    - Mining
    - Upgrading (full and partial)
    - Coal Bed Methane (CBM)
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# *Conventional Production Methods*

- Natural gas, light, medium, heavy crudes
  - Production Methods
    - Largely dependent on formation pressure, porosity, permeability and age of well
  - “Pull” techniques
    - Reciprocating pumps (pump jacks)
    - Rotary pumps (vane submersibles, positive displacement)
  - “Push” techniques
    - Water flood, gas/solvent flood, steam flood, THAI, fireflood
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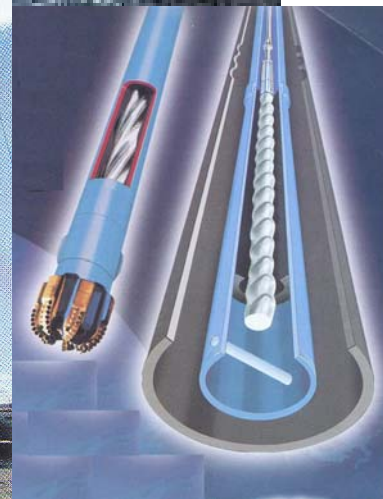
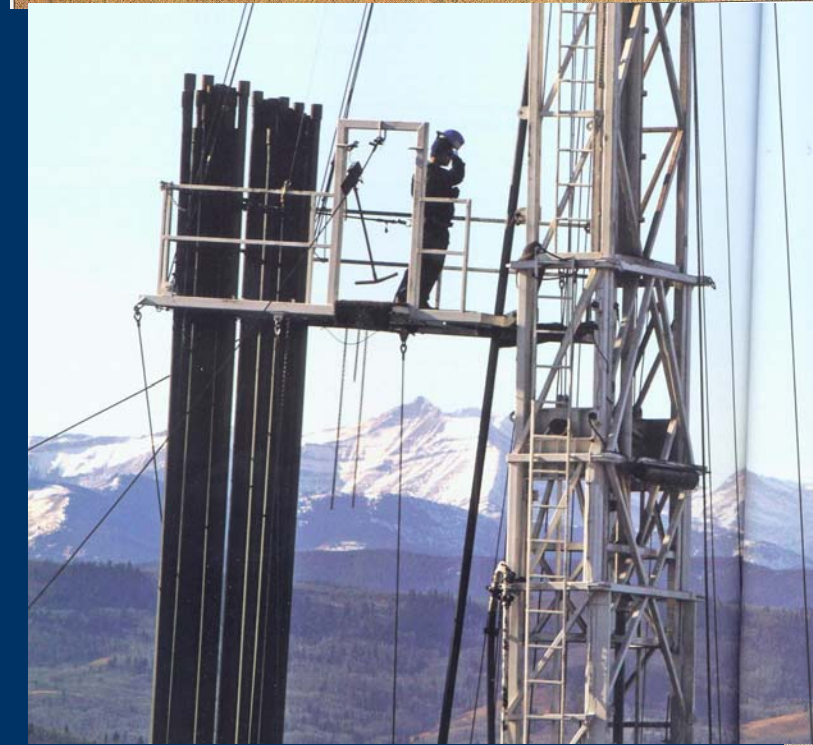
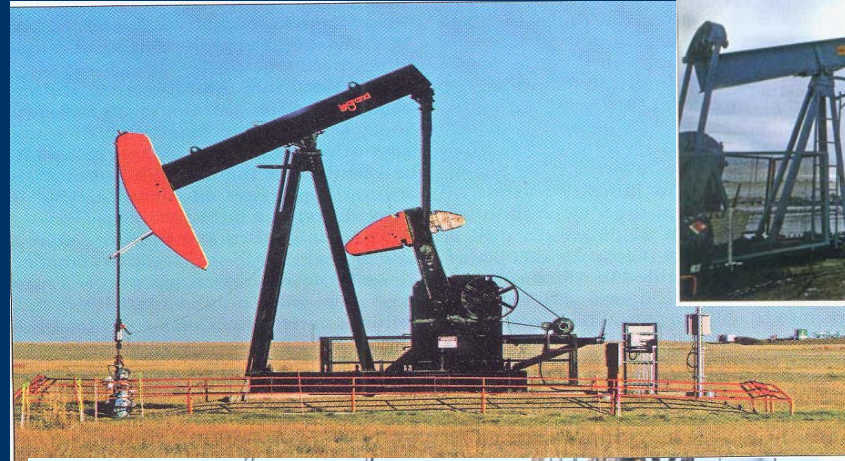
# API, Sulfur Trends Conventional Production



Drayton Valley

Kindersley

# Conventional Production



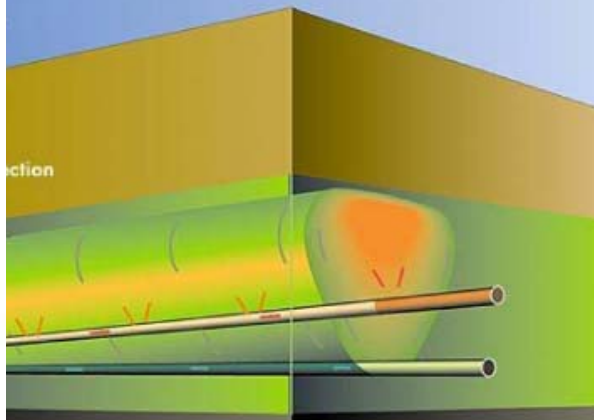
# *Non-Conventional Production*

- Coal Bed Methane (CBM)
  - Mining
  - Cyclic Steam Stimulation (CSS)
  - Steam Assisted Gravity Drainage (SAGD)
  - Vapour Extraction (VapEx)
  - Upgrading (full and partial)
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# Non-Conventional Production

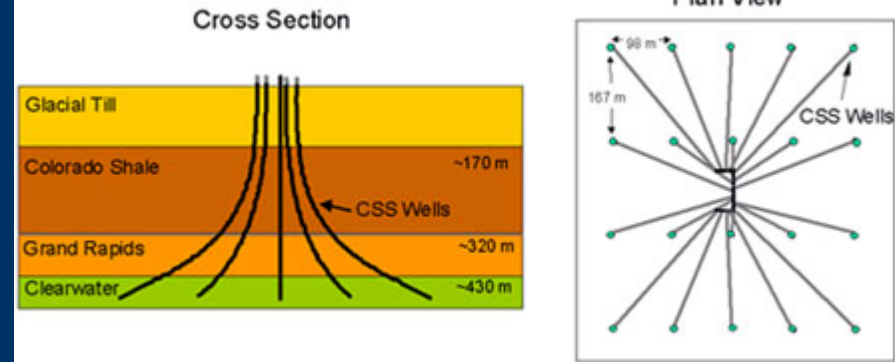


Steam Assisted Gravity Drainage



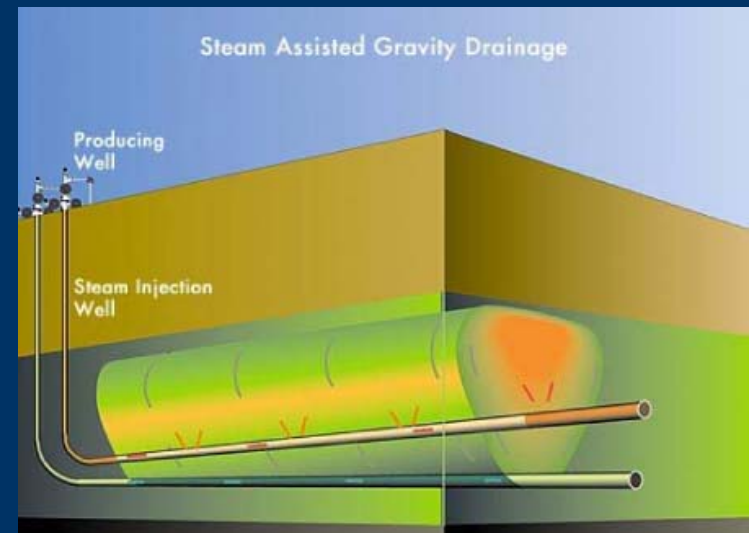
# Cyclic Steam Stimulation

- Cold Lake bitumen production
- production zones are deeper than in SAGD and mining operations
- inject steam into zone, then allow heat to diffuse into formation
- move in pump jacks and start production



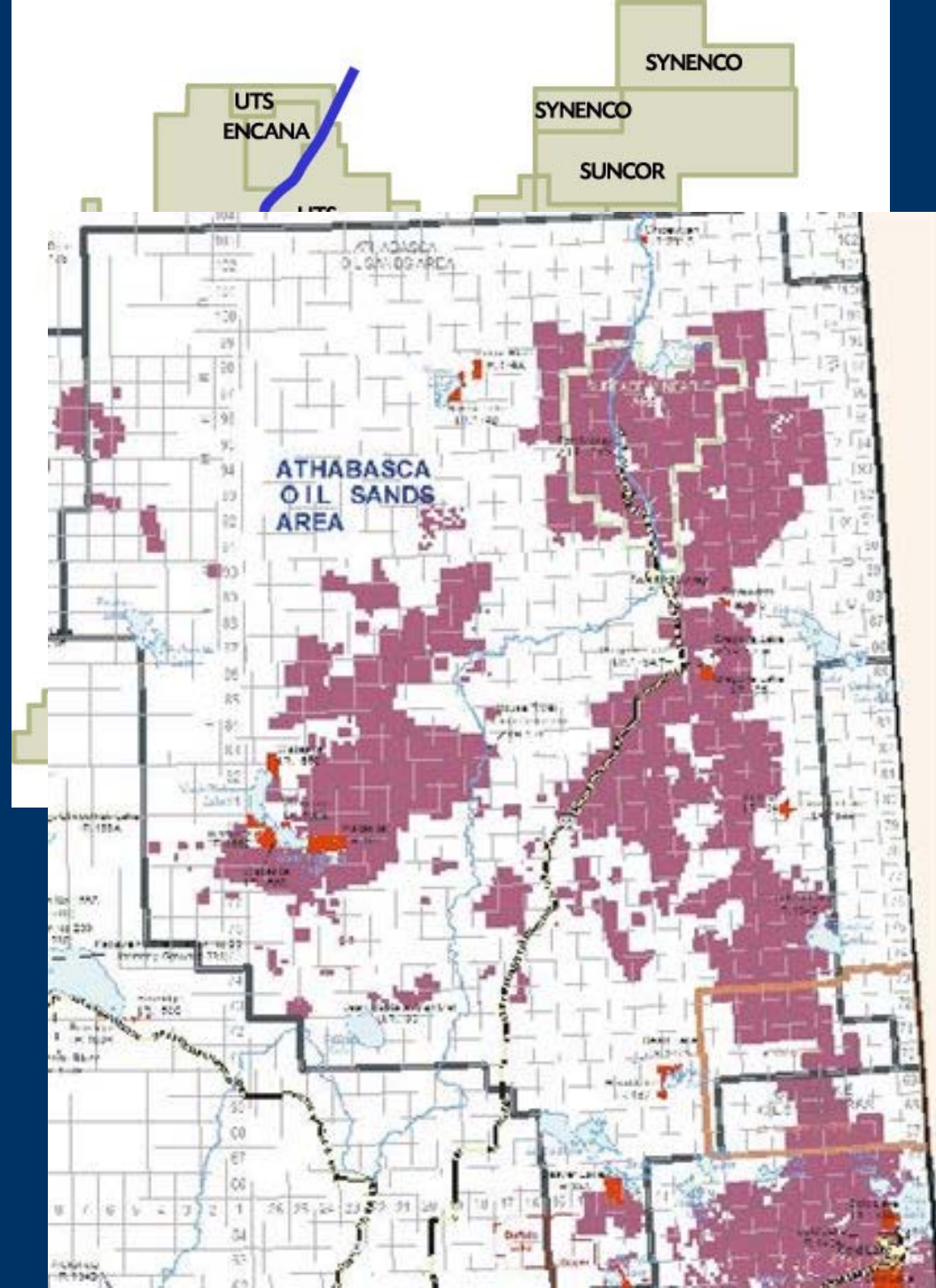
# *SAGD (steam assisted gravity drainage)*

- Series of horizontal wells (upper and lower)
- steam is applied to upper well, formation is heated
- bitumen and condensed steam produced from lower well
- unlike CSS, heat & produce together



# Mining

- Driven by standard strip ratio, recovery economics
- all operations are truck and shovel
- bitumen production is fully or partially upgraded
- current mining economics do have geographical limits



# *Upgrading*

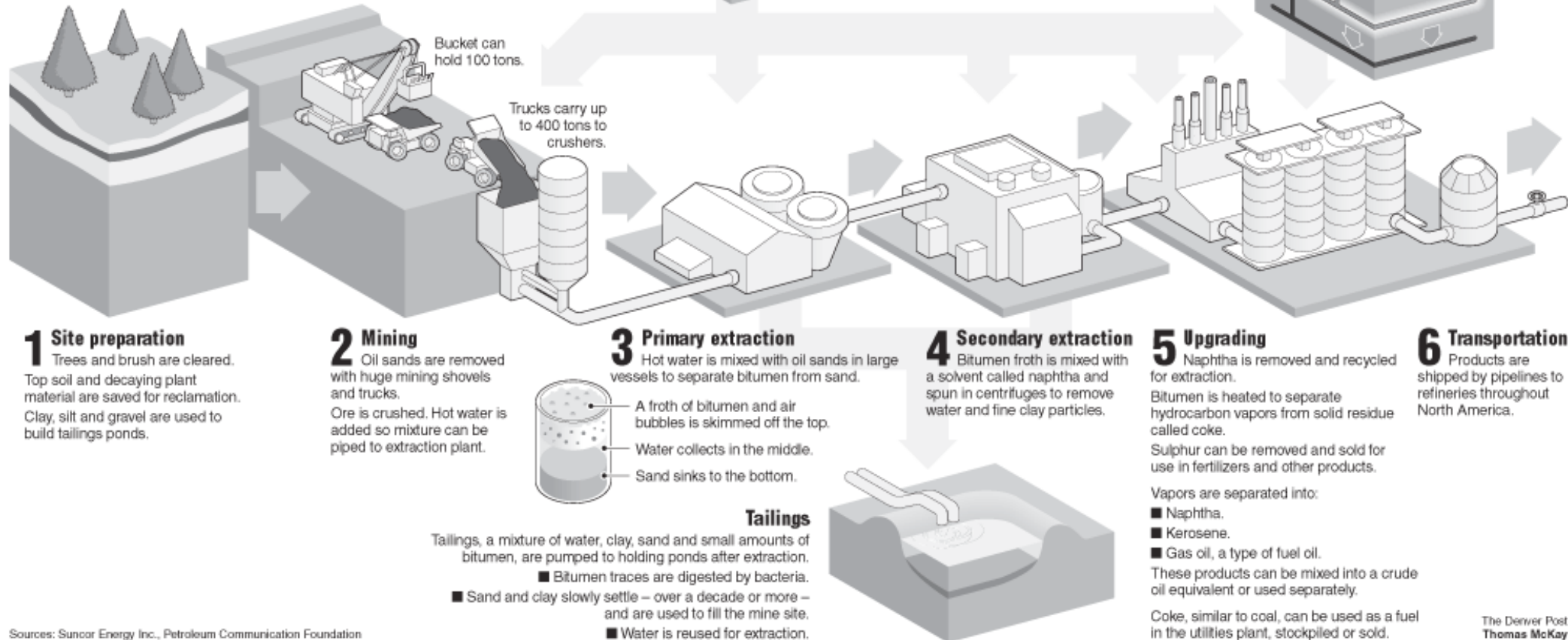
- Conventional process is to extract bitumen from sand, then coke, and hydrotreat coker products
- hydrocracking extracted bitumen more prominent
- bitumen gasification seen as critical in future
- HGO conversion will improve marketability
- market upgraders



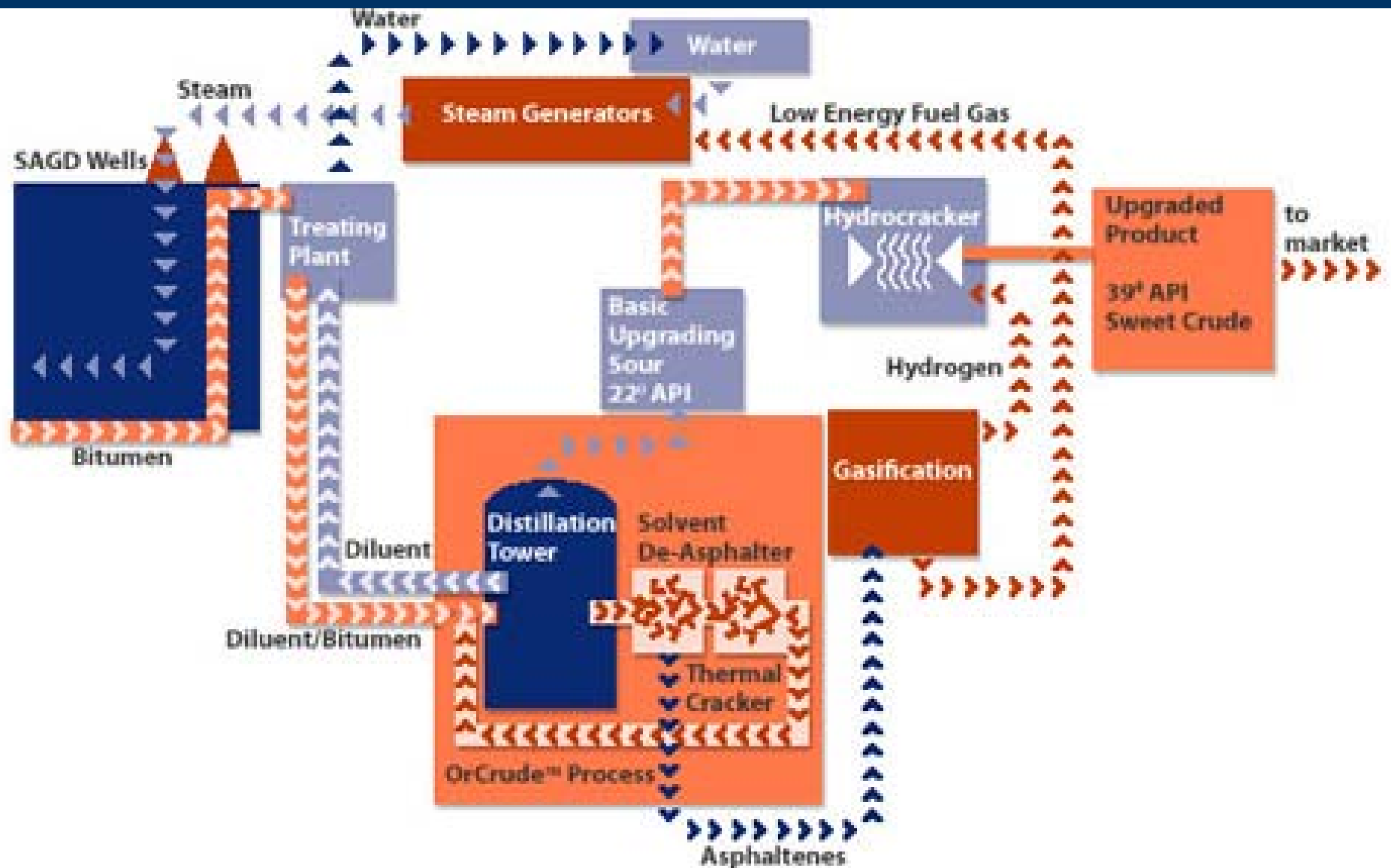
# Upgrading Mined Oil Sands

## Getting the oil out of oil sands

A multistep process is required to extract the bitumen (a thick tarlike substance) from the sand, clay and water in oil sands and turn it into something equivalent to crude oil.



# Upgrading - New Version(s)



# WCSB Product Quality

- Products
    - Conventional light, medium, heavy
    - Non-conventional dilbit, synbit, synthetic
    - custom blended products
  - Conventional streams should remain consistent into future though volumes are predicted to decrease
  - Non-conventional streams will attempt to develop market differentiation (SSB $\Rightarrow$ SSP, OS<sub>n</sub>)
  - light/heavy spreads will determine upgrading versus direct-to-dilbit decisions
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# Q & A

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