CORE

# Spent Lime Offtakes: Field, Kiln or Landfill

Producer cost comparison at an Edmonton refinery and an oil sands operation

Volumes and offtakes | Refinery | Oil sands | Client costs | Summary

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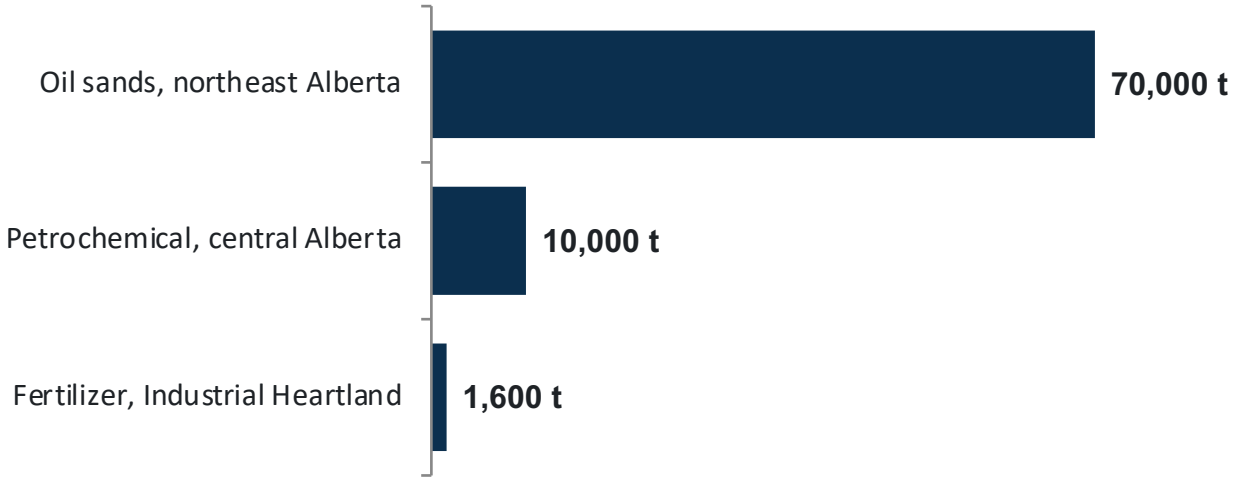
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# One Stream, 3 Offtakes

Spent lime from hot-lime water softening. Same material at every site; volumes differ by site.

**Annual generation by site (t/yr)**




**+ 21,000 t** legacy refinery stockpile, light hydrocarbon (F1) impacts



## 1. Field

Clean lime only. Fixes acidic soil and clubroot. Landowners chip in $17 to $20/t.



## 2. Cement kiln

Less strict than farmland: must mix into raw meal, odour acceptable. Tip fee ~$10/t.



## 3. Landfill

The default. $25/t to $48/t depending on whose landfill it is.

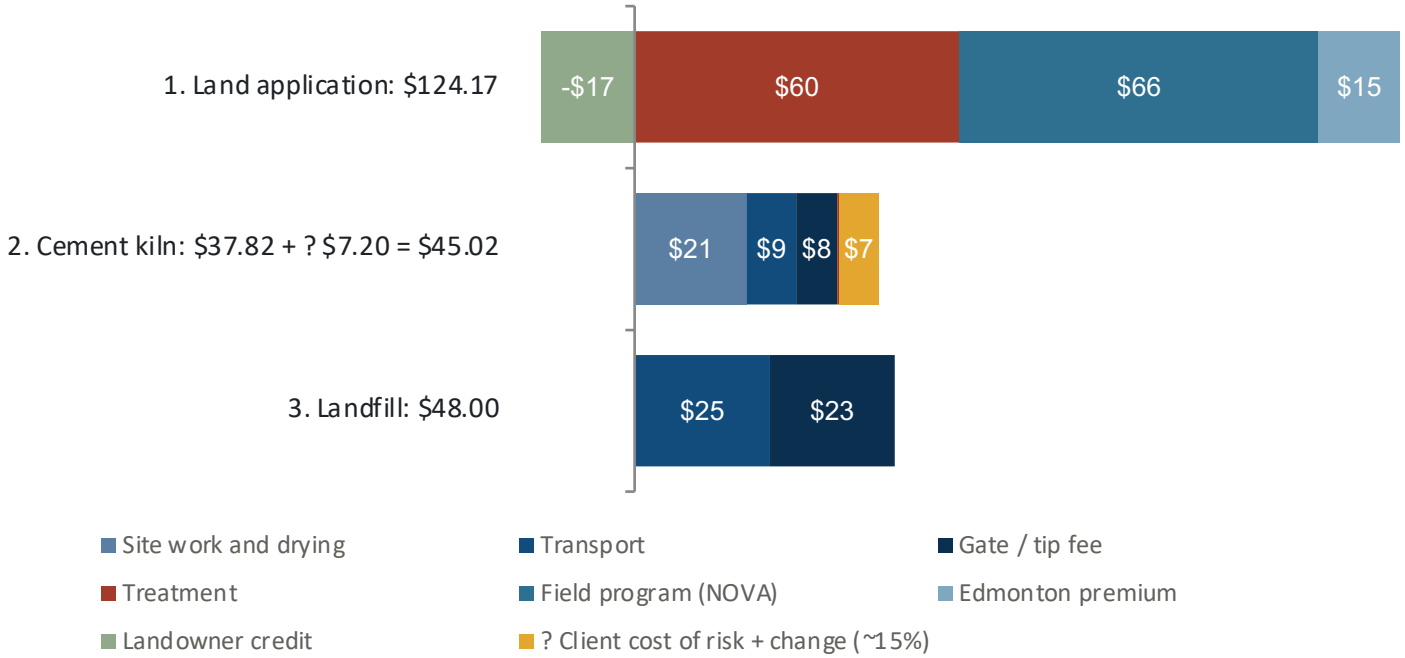
**Next:** producer cost of each offtake at two sites, compared with landfill.

Volumes: CORE program data and generator estimates; petrochemical shown at the midpoint of 8,000 to 12,000 t/yr. Sites anonymized.

# Edmonton Refinery: 3 Offtakes Compared

Hydrocarbon-impacted lime. Thermal treatment to farmland standard adds about $60/t to land application.

**Producer cost per wet tonne (landowner share shown as a credit)**






### 1. Land application $124.17/t

**Costs $76.17 more than LF (+159%)**

Includes ~$60/t thermal treatment (10-yr payback). Landowners cover $17.19/t.



### 2. Cement kiln $37.82/t

**Saves $10.18 vs LF (21%)**

Add ~$7.20/t for risk and cost of change: $45.02, still under landfill.



### 3. Landfill $48.00/t

**Baseline**

$25/t transport + $23/t gate. Nothing recovered.

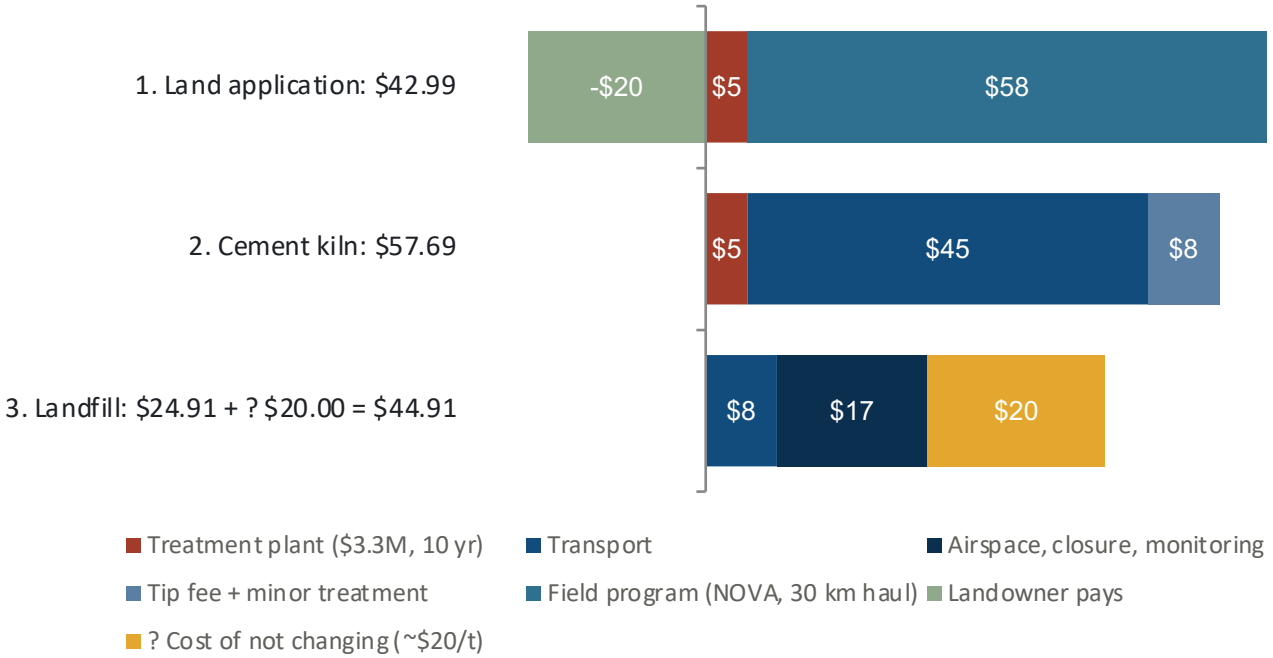
**Result:** Kiln saves $10.18/t vs landfill. Here the ? is positive: risk and cost of change (~$7/t) sit on the kiln side, and the kiln still wins. Land application is $124.17/t.

? = ~15% of $48 = $7.20/t (CORE 2024 estimate). LF: $25/t transport + $23/t gate, site handling excluded. Kiln: CORE 2024 model + $0.38/t treatment. Field: NOVA 2025 gross $66.35/t + $15/t Edmonton + ~$60/t thermal (10-yr payback) - $17.19/t landowner.

# Oil Sands Operation: 3 Offtakes Compared

Hydrocarbon-impacted lime, 70,000 t/yr, on-site landfill, $3.3M treatment plant.

**Producer cost per wet tonne (landowner payment shown as a credit)**






### 1. Land application $42.99/t

**Saves $1.92 vs LF once the ? is counted**

Plant treats to soil-amendment grade. Farms 30 km away pay $20/t.



### 2. Cement kiln $57.69/t

**Costs $12.78 more than LF, even with the ?**

~290 km to the Edmonton kiln. Haul is $45/t.



### 3. Landfill $24.91/t

**Baseline**

$16.91 cell + $8 haul. Add ~$20/t for hard-to-build cells: $44.91.

**Result:** On paper landfill is lowest at $24.91/t. Add ~$20/t for hard-to-build cells and landfill is $44.91/t, so land application ($42.99/t) is $1.92/t ahead.

LF: $10M cell, 1 Mt filled over 10 yrs, $3M closure, $100k/yr monitoring yrs 11 to 100, levelized at 5%, + $8/t haul. Plant: $3.3M / 10 yrs / 70,000 t. Kiln tip $10/t on dried tonnes. Field: NOVA 2025 gross with $12/t haul (30 km) in place of $20.07/t.

# What I Wish I Knew: The Question Mark

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The delta is only half of it. The client also weighs the cost of changing against the cost of not changing, and neither is usually quantified.

**Delta** = landfill cost − circular cost

It moves when **Delta > ?**

## +? Cost of changing (counts against the circular option)

### Risk and failure ?

Liability once lime leaves the gate. A load fails spec, the kiln goes down, the season ends early.

### Cost of change ?

A new contractor on site, internal approvals, staff time, changing a routine that works.

## −? Cost of not changing (counts against landfill)

### Doing it the same way ?

Cells fill up and new ones are hard to permit. Closure and long-term liability keep growing.

### External factors ?

Landfill fees, fuel and limestone prices can rise. Policy, tariffs and onshoring can change what local material is worth.

*We shrink this side with data, by handling permits and logistics, and with a backup route.*

**The ? cuts both ways.** Refinery: the cost of changing (~$7/t) sits on the kiln, and it still wins. Oil sands: the cost of not changing sits on landfill, so change can win at a higher cost per tonne.

? = cost of changing minus cost of not changing. Positive when the status quo is safe; negative when the status quo is itself at risk.

# Summary and Asks

What the two examples show, and what would move more lime out of landfill.

## Regulators

A clear pathway for industrial by-products, instead of borrowing sludge and wood ash guidelines

## Producers

Price the full landfill cost: closure, monitoring and liability, not just airspace

## Offtakers

Publish specs and receiving windows. Farms and kilns need different lime

1

### Route by material quality

Clean lime to land application; hydrocarbon-impacted lime to the kiln.

2

### Treatment vs volume

~$60/t at the refinery; ~$5/t at 70,000 t/yr.

3

### Landowner price needed

Oil sands land application breaks even at ~$38/t paid by landowners.

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