ASHCOR

Circular Solutions:

Ashcor’s Guide to CCP Harvesting and Beneficiation

October 2024

We acknowledge the Traditional Owners of the country on which we are meeting today and recognise their continuing connection to land, waters and culture. We pay our respects to Elders past, present and emerging.

Barb Bosh

Senior Advisor, Business & Sustainable Development

- 30 years of experience working in the electricity industry
- Environmental and regulatory experience
- Lead on variety of projects including EPRI SO_2 reduction testing
- Site assessments on coal ash dams for utilities
- Site environmental approval renewal and amendment applications, stakeholder consultations, and negotiating draft approval clauses with the regulator

Direct involvement in the construction, commissioning, operation of the RAM facility in Alberta.

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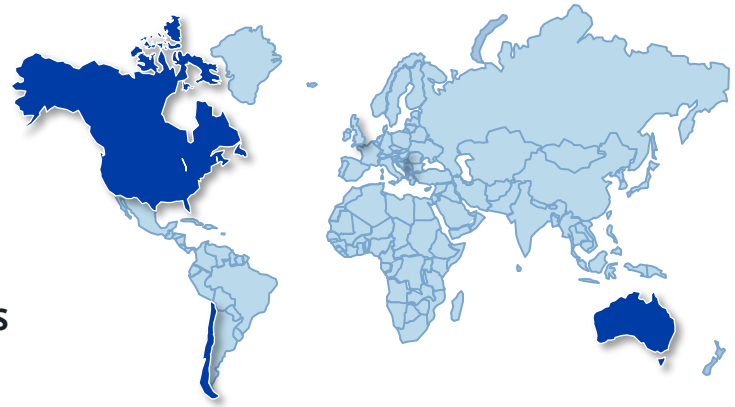
OUR PARENT COMPANY

ATCO

ATCO Group Overview

100+
COUNTRIES IN OUR 77-YEAR HISTORY

2M
GLOBAL CUSTOMERS



$24.1B	$5B	7600	7	17	6
ASSETS	REVENUES	EMPLOYEES	MODULAR BULDING MANUF. FACILITIES	PORT FACILITIES	PORT OPERATIONS SERVICES

105,000 KM	637 MW	85,200 M^3/D	64,000 KM	117 PJ	550,000 M^3
ELECTRIC POWERLINES	POWER GENERATION OPERATED	WATER INFR. CAPACITY	NATURAL GAS PIPELINES	NATURAL GAS STORAGE CAPACITY	NATURAL GAS LIQUIDS STORAGE CAPACITY

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ATCO CEO, Nancy Southern at The Australian Hydrogen Conference (West) 2022

ATCO Australia™

$2 BILLION
IN ASSETS

2
POWER PLANTS
GENERATING 244MW

2
MODULAR BUILDING
MANUFACTURING FACILITIES

700+
EMPLOYEES

MORE THAN
800,000
CONNECTION POINTS

MORE THAN
14,500KM
OF PIPELINES

Part of the Australian Community Since the 1960s

- ATCO first started working in the Australia marketplace in 1961 with the establishment of a modular structures plant in South Australia.
- In the 1990s, the Australian subsidiary of CU Power International (now ATCO Power) commenced construction and then commissioned a 180MW cogeneration plant in Osborne, South Australia.
- In 2010, ATCO opened a gas fired power station in Karratha, Western Australia.
- In 2011, ATCO brought all of their operations together in Australia to establish ATCO Australia. 2011 also saw the acquisition of WA Gas Networks (previously Alinta Gas Networks), and its subsequent re-branding to ATCO Gas Australia.
- In 2023, the South Australian government awarded an early contractor involvement (ECI) agreement with ATCO and BOC Linde as preferred partners to deliver its Hydrogen Jobs Plan.


DESTINATION BACK-OF-BEYOND

WOWIC transportable accommodation — the answer to workforce housing problems, whatever the location, however remote.

WOWIC units are delivered on site — complete ready for occupation and use. They can be supplied to fill every accommodation need • bunkhouses • washcars • kitchens and diners • recreation rooms • offices • schools • houses.

WOWIC units are designed to be moved. A steel chassis allows easy transport by road trailer, railway or ship. Units can be designed for helicopter or air-cargo lift. WOWIC units can be transported to any place in the world.

WOWIC transportable accommodation provides the city standard comfort that attracts and holds a high grade labour force. Employee turnover stays down— output goes up. WOWIC units can be installed complete within weeks of the signing of contract.

For full details on how WOWIC can help with your accommodation needs, please contact

WORLDWIDE CAMPS PTY. LTD.
Barfield Crescent, Elizabeth West, SOUTH AUSTRALIA 5113
Telegrams: WOWIC Telex: 82308 Telephone: 55 1422
SYDNEY: 77 Pacific Highway, North Sydney 2060, Telegrams: WOWIC Telex: 20364 Telephone: 92 6740
MELBOURNE: 622 St. Kilda Road, Melbourne 3004, Telegrams: WOWIC Telex: 30963 Telephone: 51 9119
PERTH: 84 St. George's Terrace, Perth 6000, Telegrams: WOWIC Telex: 92235 Telephone: 21 5618
CANADA: ATCO Industries Ltd., Calgary, Alberta
U.S.A.: Northland Camps Inc., Nampa, Idaho

The Bulletin, February 17, 1968

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ASHCOR OVERVIEW

Trusted Ash Expertise

- Headquartered in Calgary, Alberta
- Over 25 years' experience as a fly ash marketer and now an ash manufacturer
- Largest independent marketer of coal ash in Western Canada
- Aggressively expanding into the U.S. market and abroad
- Developed a patent pending technology (RAM™) to beneficiate coal combustion residuals (CCR) in ponds and landfills to meet CSA A3000 and ASTM C-618 fly ash requirements
- Commissioned and operating RAM since January 2021

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CIRCULAR SOLUTIONS

Ashcor's Guide to CCP Harvesting and Beneficiation

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Regulatory

- Development permits
- Australian Standard changes to accept harvested ash
- DOT acceptance
- Environmental permits

Stakeholder Engagement

Resource Qualification

RAM

Customized Beneficiation Solution

- Utilities tie-in
- Ash quality considerations
- Dewatering

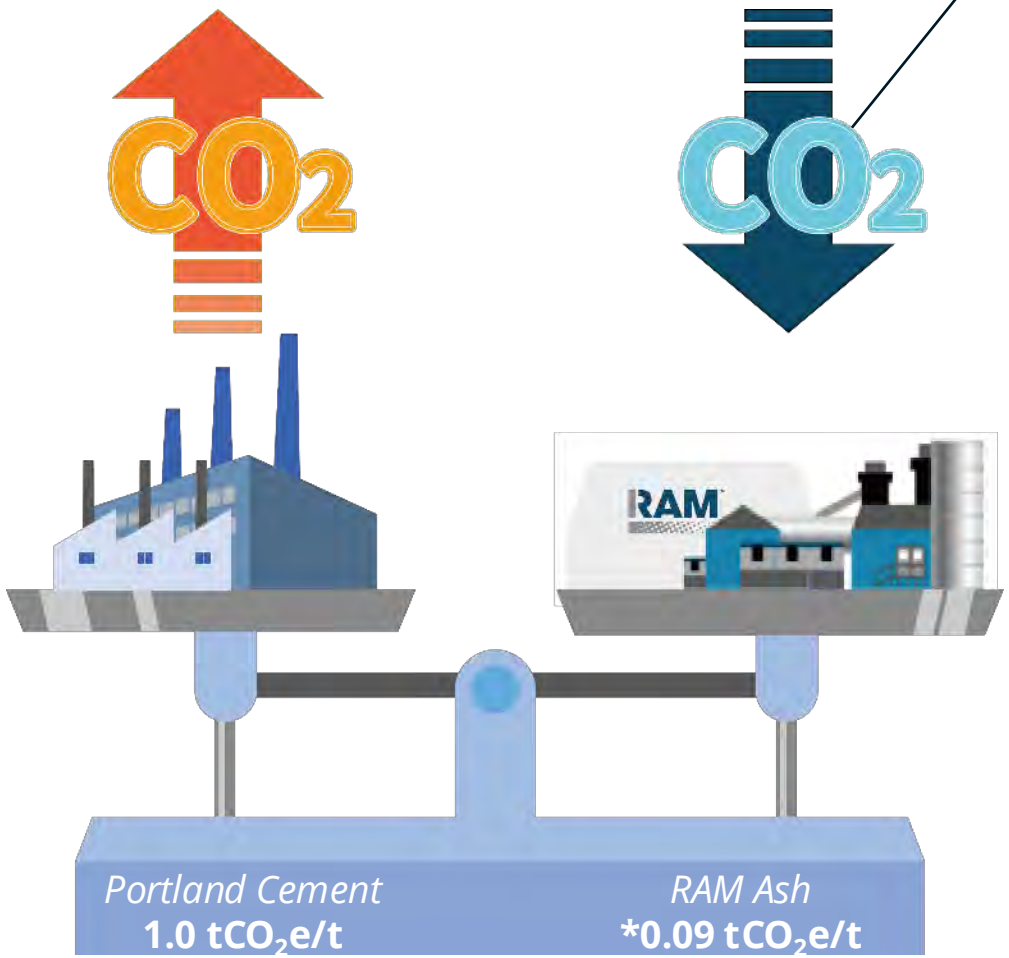
End User Transition

Key Considerations

- Federal, State and Local Regulatory Considerations
  - Each location and ash dam will likely have unique requirements
- Standards Updates
  - Australian Standards (AS) changes or updates
- DOT acceptance and incorporation of beneficiated coal ash
- Development permits
  - Type of process and equipment, footprint, etc.
  - Environmental permits
  - Air
  - Water
  - Dewatering, groundwater, surface water, etc.
- Land use/Long Term Site Use
  - What will the site transition to, i.e., battery site, solar development, public use?

REGULATORY

Greenhouse Gas Reduction



Using harvested, manufactured ash as an SCM (supplementary cementitious material), is a more environmentally friendly option compared to using straight cement, as cement manufacturing has greater adverse GHG impact.

- RAM ash offers a 90% reduction* in GHG intensity compared to portland cement manufacturing
- Fly ash is a direct replacement for up to 25% of the portland cement used in concrete and oilfield cementing
- Without a substitute SCM, concrete producers may replace fly ash with portland cement in their mixes

**Assumes no carbon reduction is required by RAM.*

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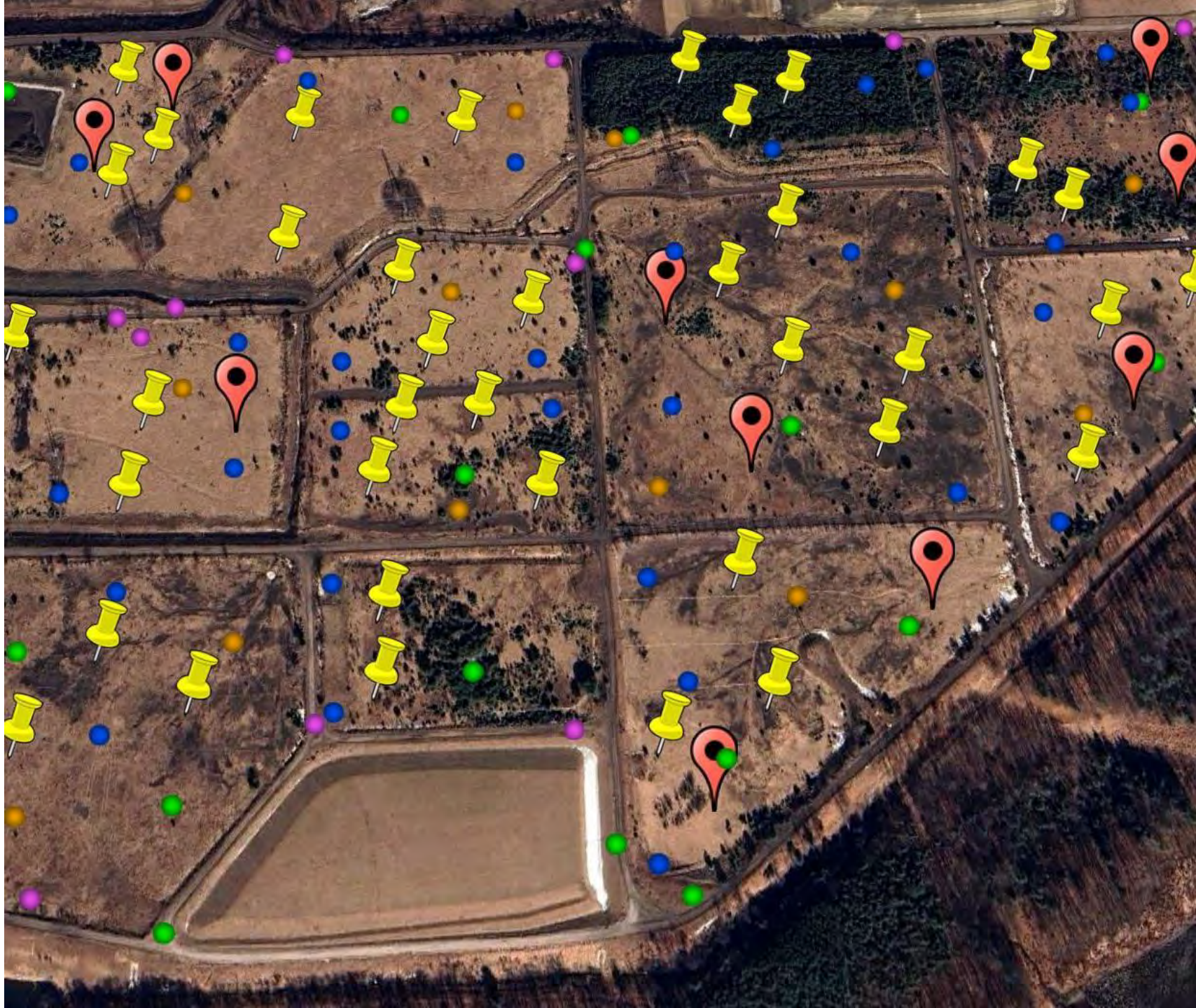
STAKEHOLDER ENGAGEMENT

Regulatory Approval and Market Acceptance

Stakeholders	Key Challenges
Regulators	Unfamiliarity with how to regulate as the project was first of its kind in Canada
Community	Minimal challenges but required education on the project and understanding of the positive economic and environmental impact
End Users	Quality concerns as they transition from live ash to manufactured/reclaimed ash

RESOURCE QUALIFICATION

Resource Exploration and Qualification



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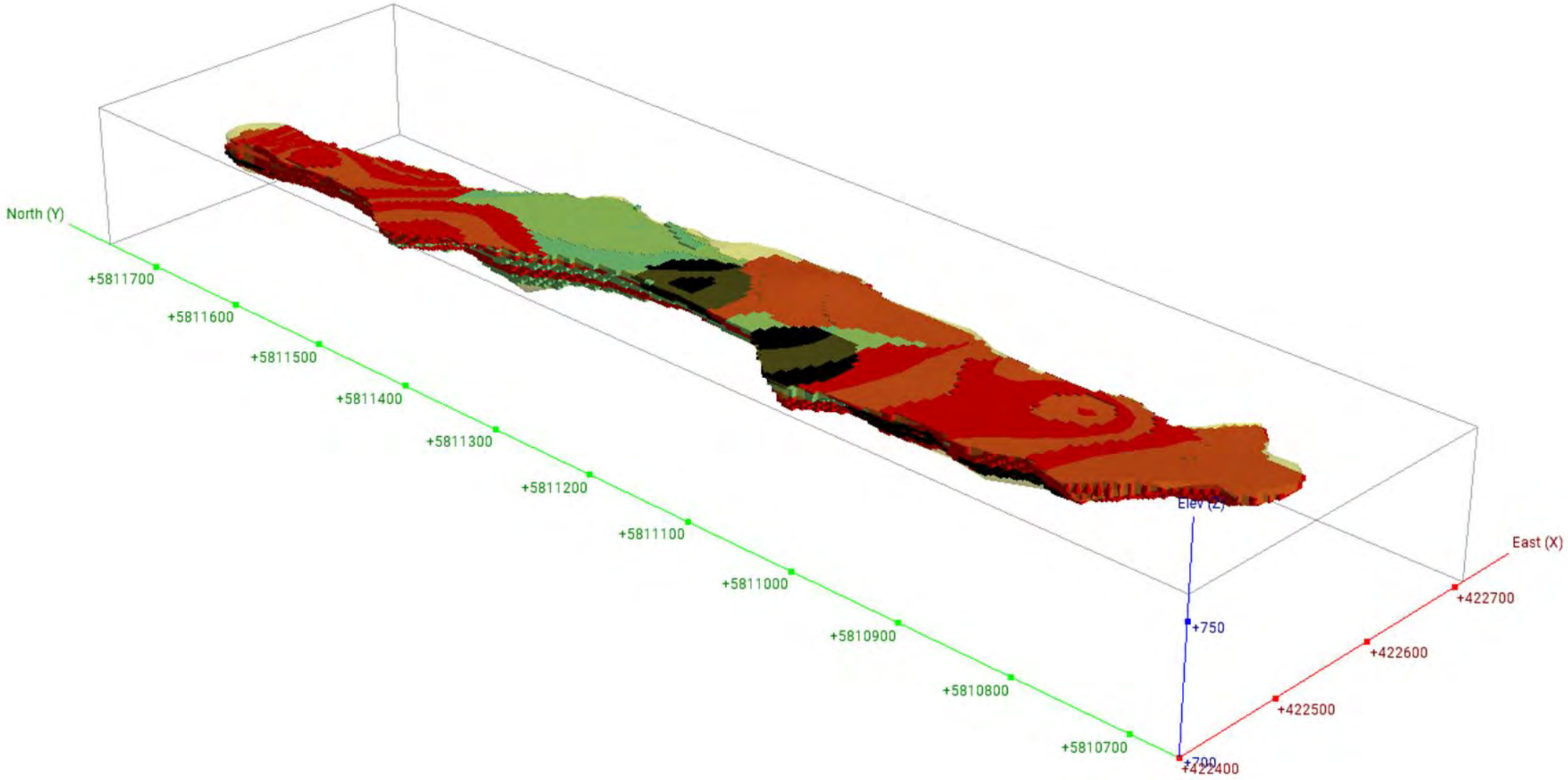
RESOURCE QUALIFICATION



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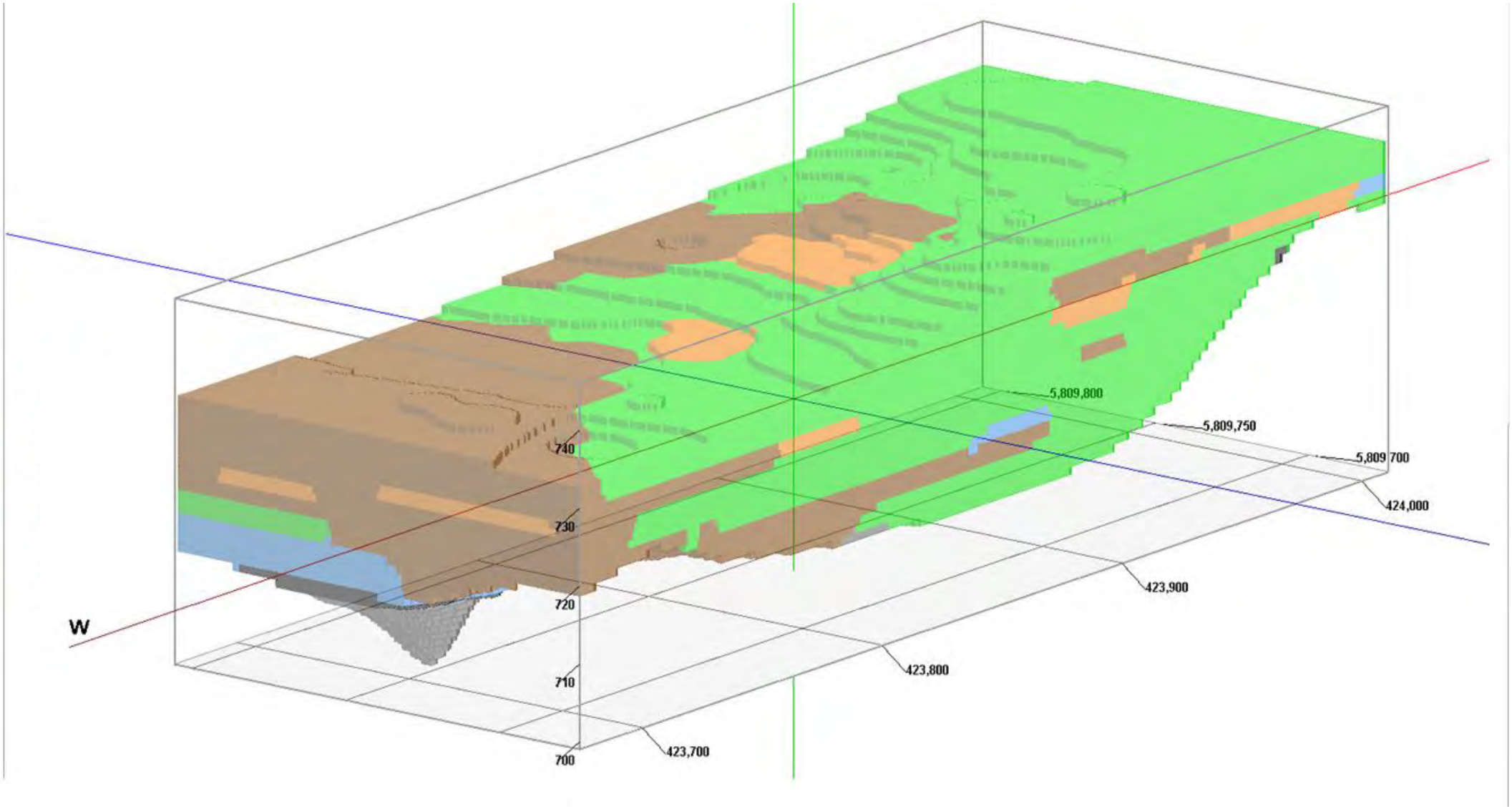
RESOURCE QUALIFICATION



RESOURCE QUALIFICATION

Drilling Site	# of Areas, Ponds and/or Dams	Types of Exploration	Preexisting Data	Key Learnings
1	2	drilling	some	FGD and "other areas"
2	4	drilling	some	“Other"
3	8	drilling/trenching	none	Mixed material/dewatering
4	1	drilling	some	Construction waste
5	1	drilling	some	C ash, can't drill with hollow stem
6	3	drilling	some	“Blowouts" possible
7	2	drilling	some	Can drill in gale force winds in winter
8	2	drilling	some	C and F ash mixed - must drill with water on C ash
9	2	drilling	some	Very old deposit - can find a needle in a haystack
10	1	drilling	some	Access after major rains are difficult even with tracked rigs
11	1	drilling	some	Terraced site designed for solar can be challenging
12	13	drilling/trenching	quite a bit	Sonic drilling can exaggerate the appearance of wet layers of ash
13	6	drilling	some	Historical data is not always accurate
14	1	drilling	some	Excellent and no surprises!

CUSTOMIZED BENEFICIATION SOLUTION

Our Flagship RAM Facility

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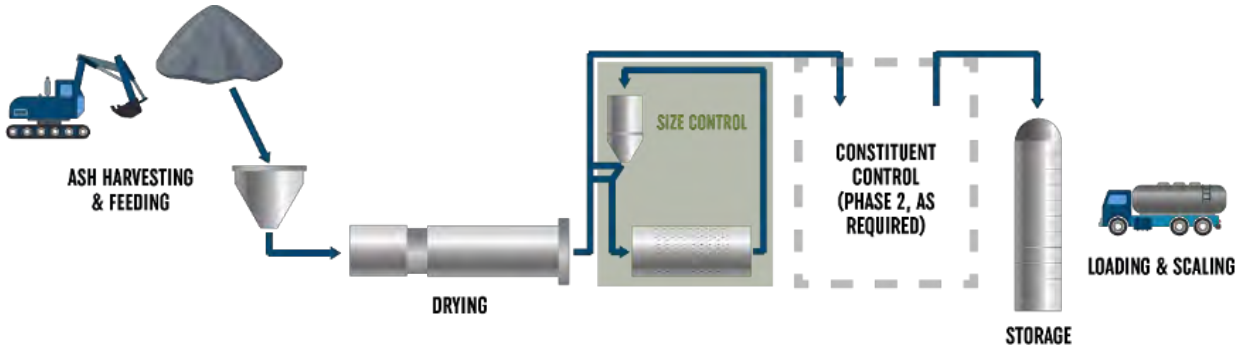
CUSTOMIZED BENEFICIATION SOLUTION

Reclaimed Ash Management



PATENT PENDING

RAM™

- Simultaneous processing both fly and bottom ash
- Zero waste
- Low capital to capacity cost
- Substantial CO_2 reduction in concrete

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END USER TRANSITION

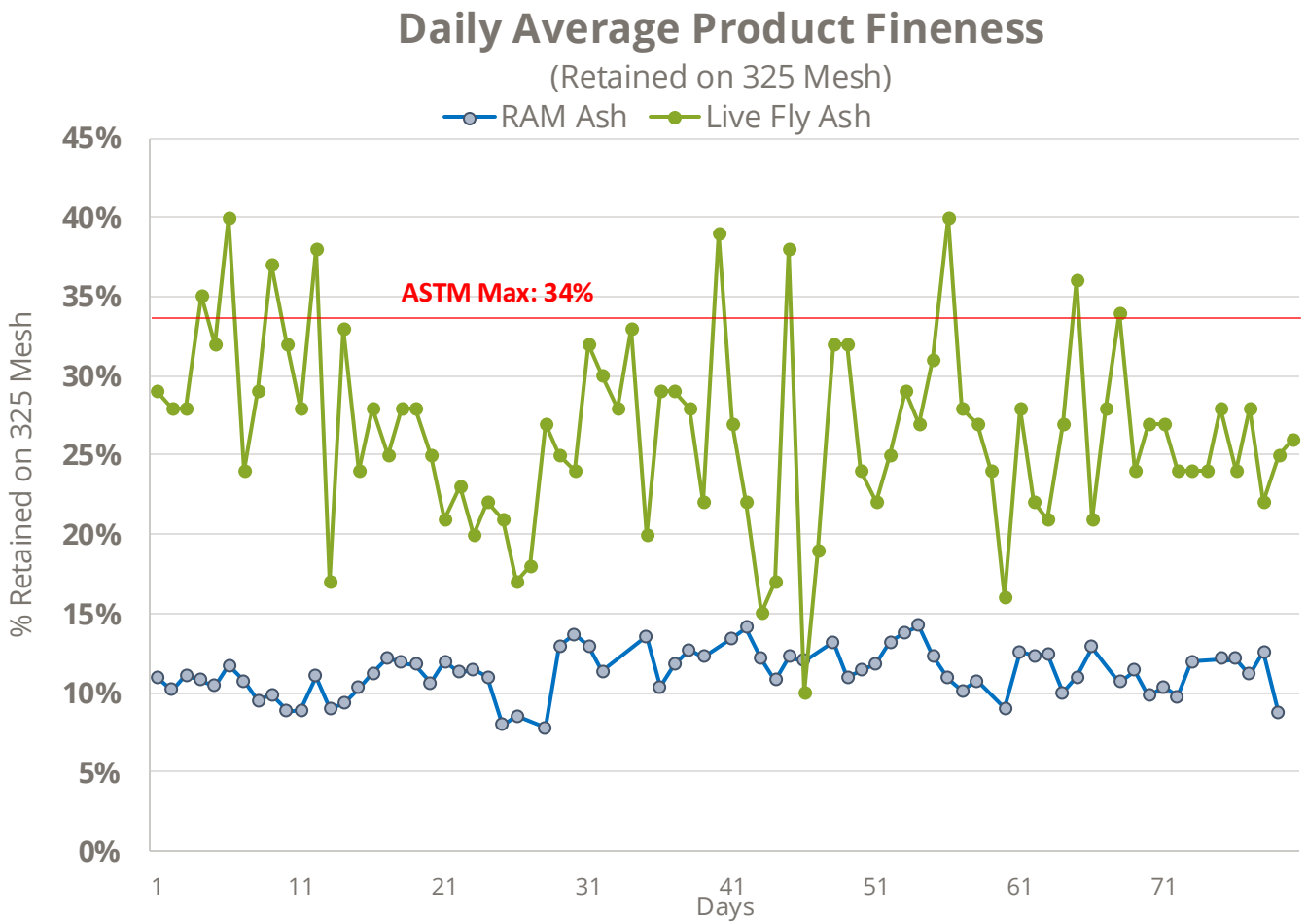
Impacts on Live Ash Supply

- Selected unit shutdown
- Cycling units
  - As other forms of electricity come on the market, coal stations will cycle more and even be dispatched offline.
    - Leads to a negative impact to ash quality even if enough supply is available
    - Results in more ash going for disposal (increased landfill costs and decreased air space).

Battle River Generating Station
Forestburg, AB

Sheerness Generating Station
Hanna, AB

The Quality Opportunity

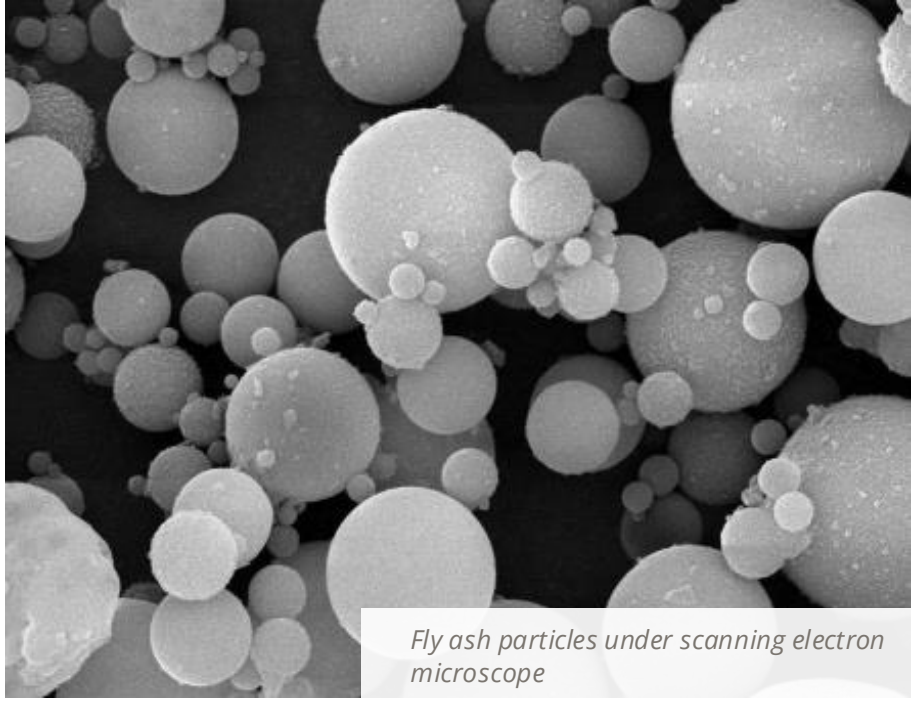


- Ash fineness is a key quality metric that impacts reactivity
- As a manufactured product, RAM ash quality can be better controlled
- Preferred product because of the consistency
- **Allows concrete producers to optimize their concrete mixes to lower the overall cementitious content**

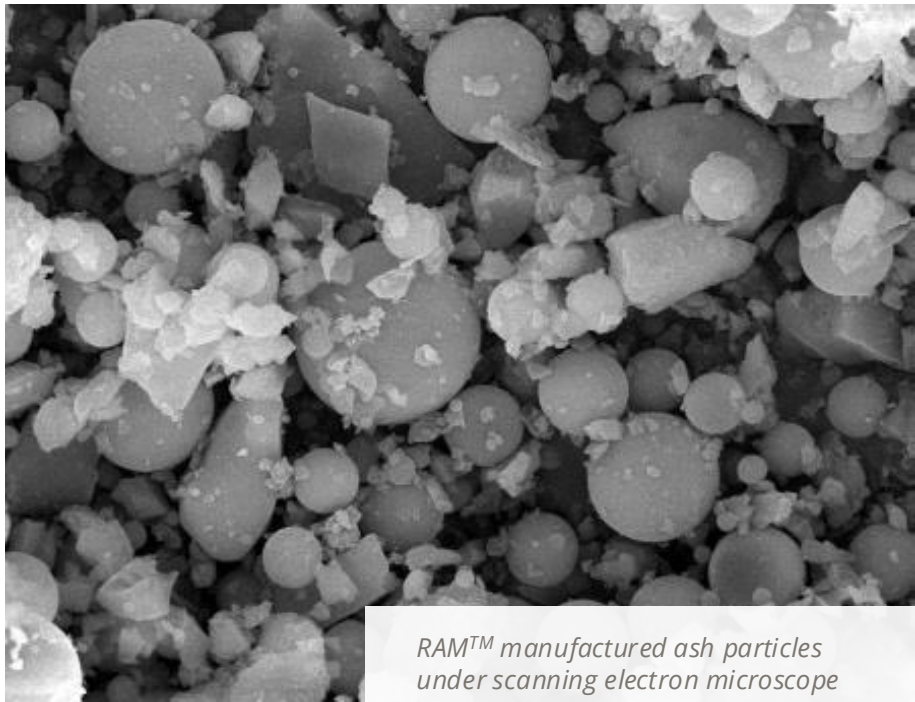
END USER TRANSITION

Manufactured Consistency

- Fly ash particles have a spherical shape when viewed under a scanning electron microscope
- The spherical shape is important because it improves the fluidity of concrete, while acting as miniature ball bearings within the concrete mix, which lubricates the mix, improves pumpability and reduces porosity of concrete
- Ashcor's manufactured RAM ash (a blend of fly and bottom ash) still retains the important spherical shape of the ash particles
- Our RAM ash meets and often exceeds the Canadian standard (CSA A3000) and American standard (ASTM C618) for harvested coal ash



Fly ash particles under scanning electron microscope



RAM™ manufactured ash particles under scanning electron microscope

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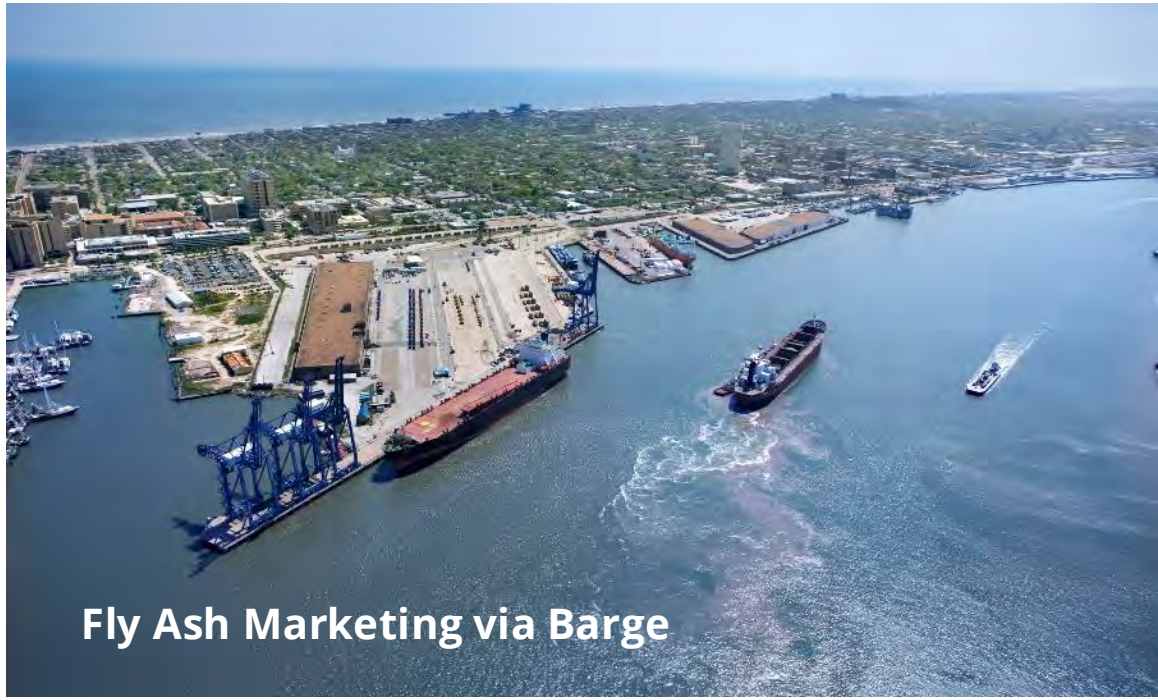
THE FUTURE

Innovation & Expansion



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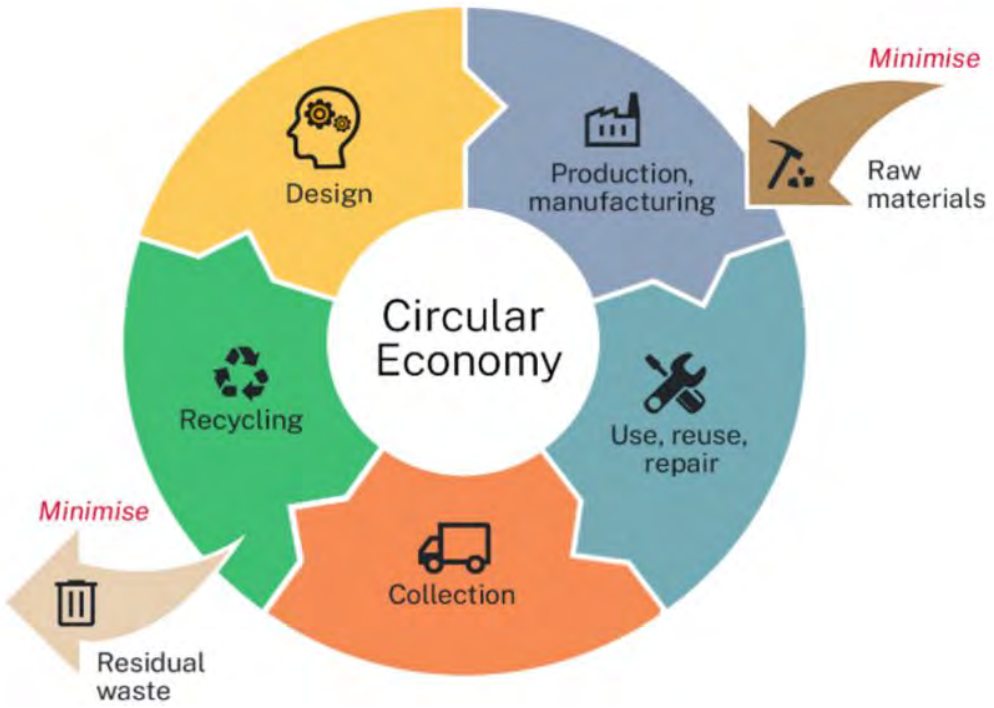
Powering a Circular Economy in Australia



Key Elements of the Circular Economy

Source: https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/public-consultations/going-circular-clean-energy

- Establish Australia as a leader in ash reuse applications
- Set Benchmarks for Environmental best practice in ash management

- Will create new local jobs
- Contribute to community revitalization
- Will foster partnerships between local government and communities

- Helps achieve Ash Reuse
- Decreases consumption of raw materials
- Restores natural systems including ash dams

- Protect the environment by reducing waste
- Moves Australia towards net zero targets by reducing GHG emissions
- Allow future reuse or development of property

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THE POWER OF RECLAIMED RESOURCES

A Sustainable Future, Today

FOCUS ON LEADERSHIP

A SPECIAL CALGARY HERALD SERIES ON CALGARY'S BUSINESS VISIONARIES
SPONSORED BY CALGARY ECONOMIC DEVELOPMENT

Ashcor turns ash into product with green benefits

JOEL SCHLESINGER
Postmedia Content Works

An ATCO company's new plant east of Red Deer is turning waste into profit, producing a climate-friendly product for the construction industry.

Ashcor Technologies has been in the business of taking fly ash — a byproduct of coal-burning electricity generation plants — and marketing it for use as a cement supplement in concrete for more than two decades.

Carbon taxes and other climate change regulations around the world have been shifting electrical generation away from coal in favour of other energy sources, putting fly ash in short supply.

Ashcor, however, has a made-in-Alberta solution, providing a new supply of fly ash amid rising demand for it in concrete production.

"We think we have a pretty exciting opportunity to capitalize on an industry shift by bringing a novel technology to the marketplace to meet growing demand," says Kelly Babichuk, general manager at Ashcor.

That opportunity is Ashcor's new, state-of-the-art facility near Forestburg. The technology refines old fly ash, and bottom ash — another byproduct from coal burning — that had been deposited in landfills, old mines and holding ponds.

The new RAM — reclaimed ash management — plant uses patent-pending technology to refine this discarded fly and bottom ash, which is plentiful, to create more of the concrete-enhancing product.

"We are definitely one of the world leaders in this field," Babichuk says.

Fly ash — and bottom ash that has been refined at the new plant — can typically replace up to 30 per cent of the cement used in concrete, which is good for the environment.

"Cement manufacturing is very carbon intensive," he says.

"So, for every ton of cement we displace in the concrete manufacturing process, we're reducing the CO_2 footprint by about a ton, too."

Not only is this ash product more environmentally friendly, Babichuk says, it also makes concrete more durable. At the same time, it addresses the environmental risks associated with old ash discarded in ponds, mines and landfills.

Another upside to the endeavour is it's a made-in-Alberta success story, Babichuk says.

"Given all that's gone on with the economy here, it's nice to make lemonade out of lemons."

Ashcor vice-president and general manager Kelly Babichuk holds some fly ash at the company's processing plant near Forestburg, east of Red Deer. *PHOTOS: WIL ANDRUSCHAK, POSTMEDIA CONTENT WORKS*

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Thank you

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