Breakout 2

Renewable heat from minewater

Fife Council

Our Climate Matters

Breakout 2: Renewable heat from minewater

Discussing ways to maximise minewater heat in Fife and the associated challenges & opportunities

- **Gareth Farr:** Head of Heat and By-Product Innovation, Mining Remediation Authority
- **Martin McGroarty:** Lead Professional (Minerals), Fife Council
- **Matthew Jordison:** Net Zero Innovation Delivery Officer, Gateshead Council

Facilitated by **Ian McCrory**, Lead Professional (Economic Regeneration)

Breakout 2:
Renewable heat from minewater

Gareth Farr

Head of Heat and By-Product Innovation

Mining Remediation Authority

Fife Council

Our Climate Matters

Mining Remediation Authority

Mine water heat & opportunities in Fife

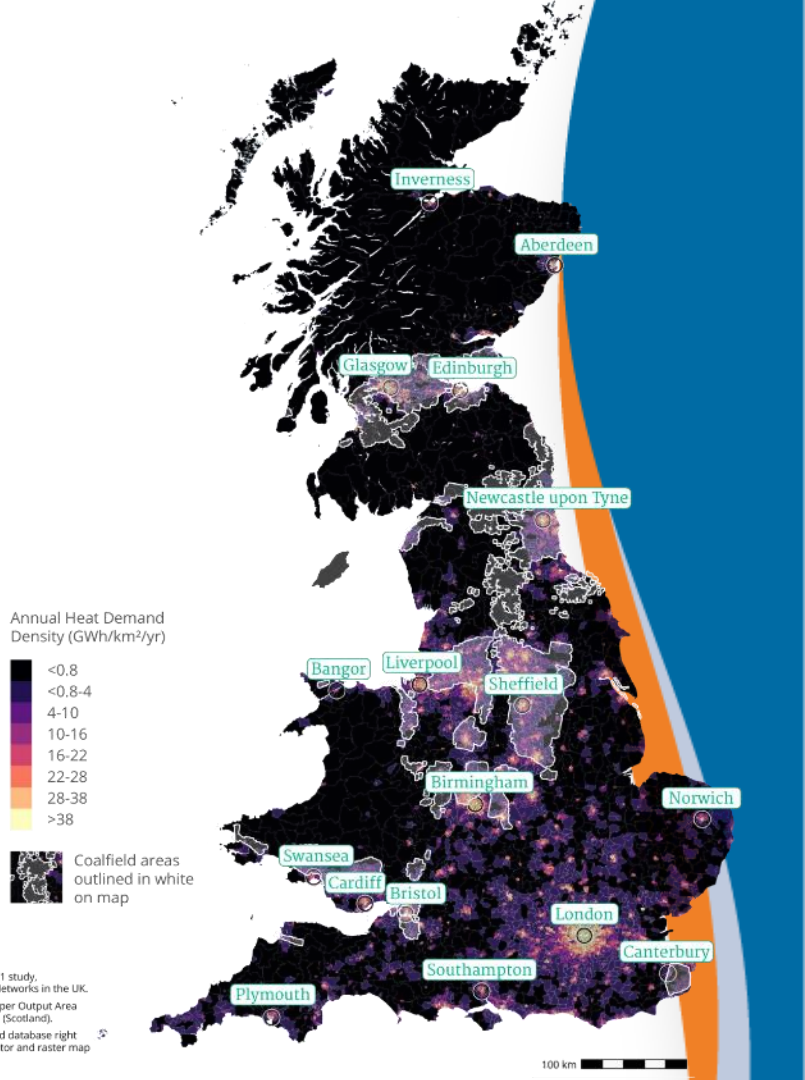
Gareth Farr

Head of Heat and By-Product Innovation

June 2025

What is mine water heat?

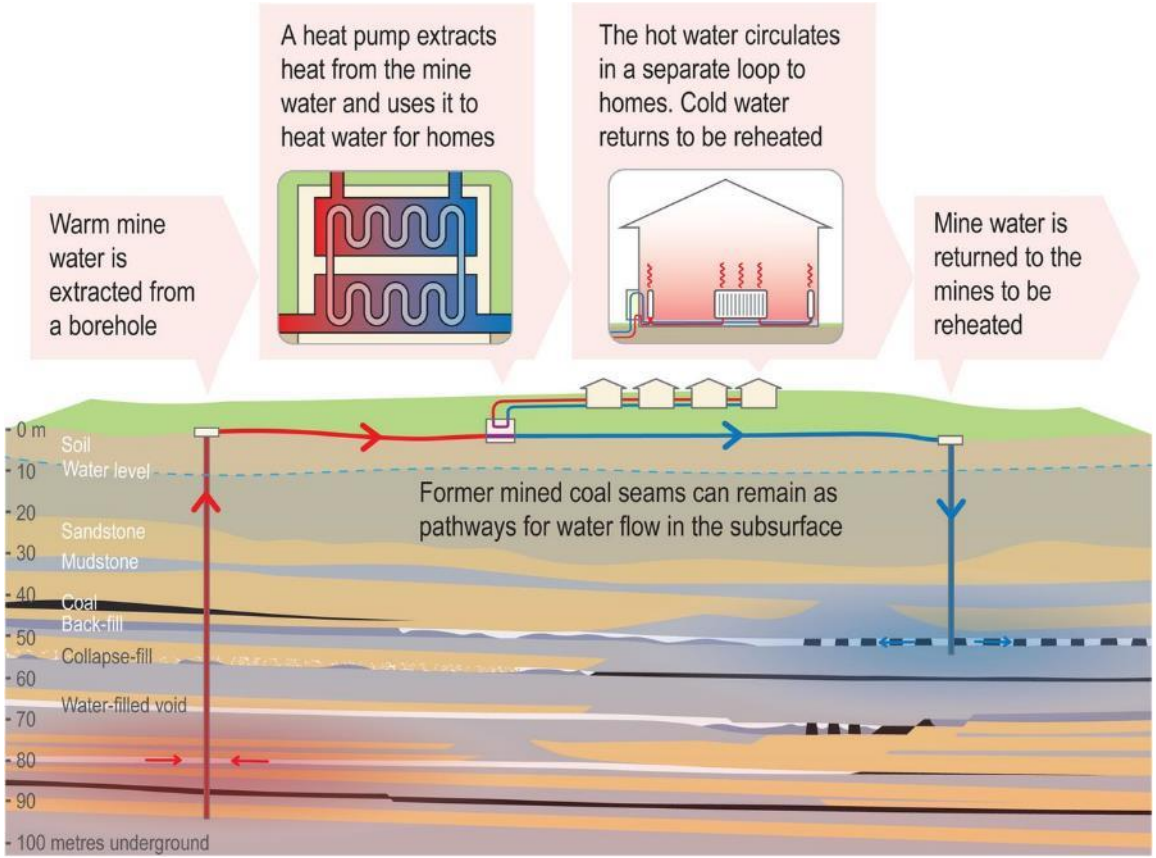
- Warmed by the geothermal gradient (10-20°C)
- Considered liability but can also be an asset
- ~25% of properties on coalfield
- Significant heating demand aligns with coalfield



Heat demand map taken from BEIS' 2021 study, Opportunity Areas for District Heating Networks in the UK.

Map shows demand by Middle Layer Super Output Area (England and Wales), Intermediate Zone (Scotland).

How can we recover heat from mine water?



How can we access mine water heat ?

Boreholes

How can we access mine water heat ?

Boreholes

Treatment Schemes

How can we access mine water heat ?

Boreholes

Treatment Schemes

Shafts/ Discharges

Lanchester Wines

Delivered by:
Privately funded/Lanchester wines

Total heat pump capacity
Abbotsford Road: 2.4 MW
Nest Road: 1.2 MW

Mine water yields
Abbotsford Road: 30 L/s
Nest Road: up to 70 L/s

Consumers
Two large beverage warehouse facilities operated by Lanchester Wines.

Status
Live

https://www.iea-gia.org/case-studies

Heat pumps at Abbotsford Road. Photo by © Jonathan Steven

Circulating citric acid solution to remove ochre scaling from the plate heat exchanger at Abbotsford Road. Photo by © David Banks

Gateshead Heat Network

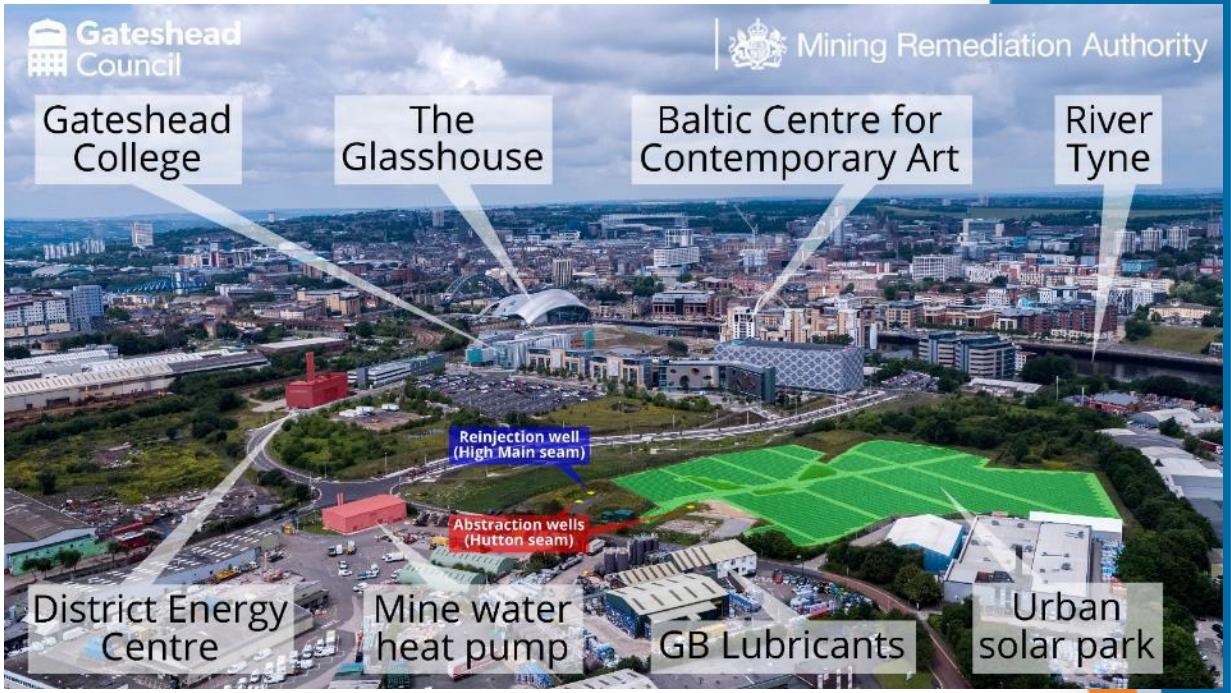
Delivered by:
Gateshead Council/ HNIP

Total heat pump capacity
6MW

Mine water yields
Up to 140 L/s

Consumers
Multiple – >350 residential, offices, public buildings, The Glasshouse &The Baltic, GB Lubricants
Consumers pay **at least** 5% lower than gas

Status
Live



Seaham Garden Village

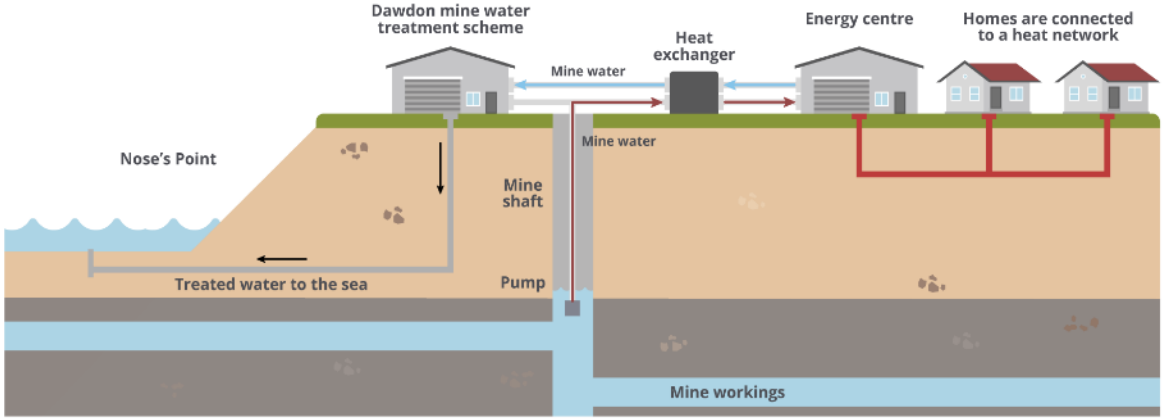
Delivered by:
Durham CC, Karbon Homes
Esh group, Funding HNIP

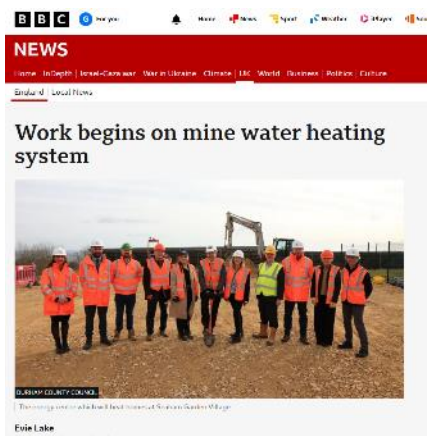
Total heat pump capacity
~3MW? (tbc)

Mine water yields
80 L/s

Consumers
750 social homes

Status
In construction




BBC
NEWS
Work begins on mine water heating system

Thermal Earth (closed loop)

Delivered by:

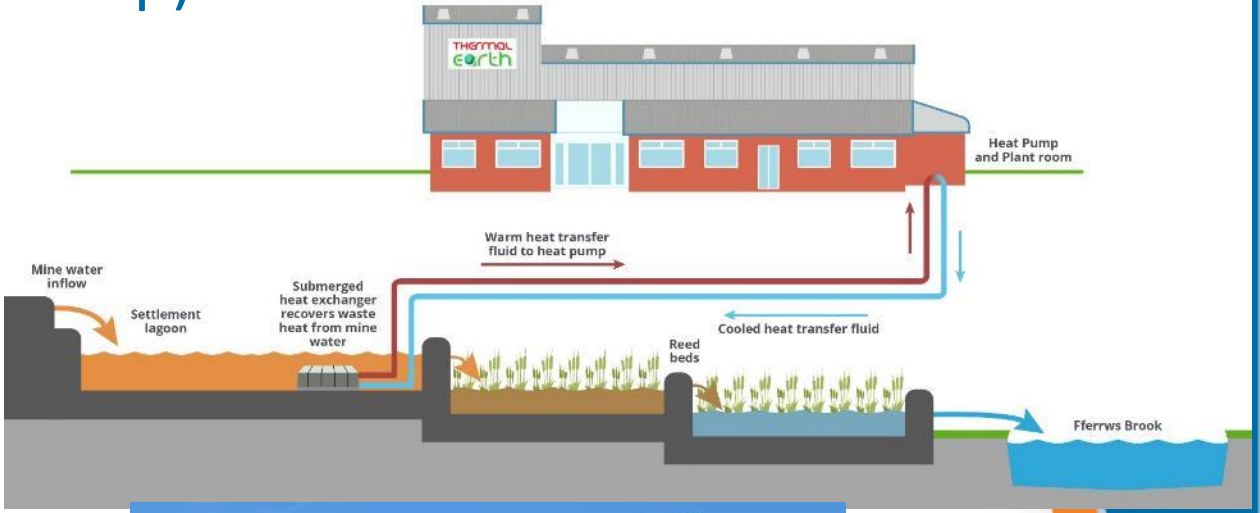
Thermal Earth/MRA/InnovateUK

Total heat pump capacity
~0.4MW

Mine water yields
Closed loop

Consumers
Industrial unit /warehouse

Status
Live



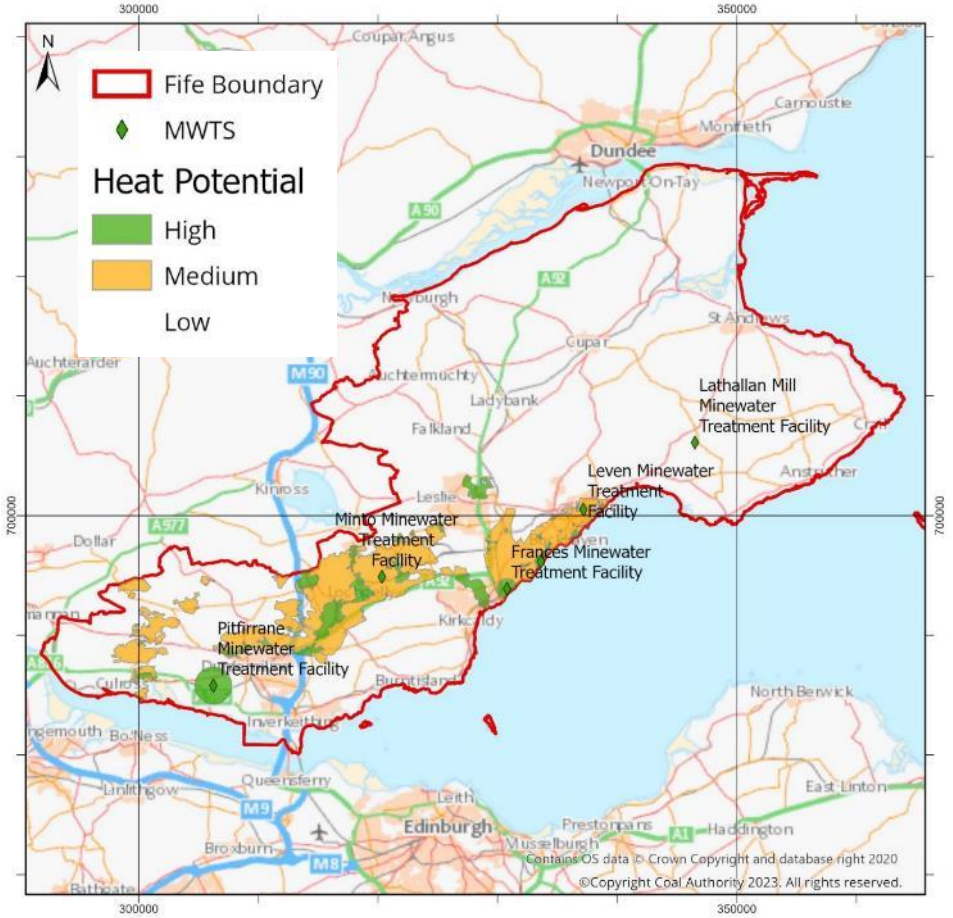
Fife: mapping mine water opportunities

- Simplify complex mining history

- **Highlights:**
  - Borehole options
  - Waste heat options

High Potential (Green)
- Vacant & Derelict Land Fund
- Settlement Boundaries
- High priority for further feasibility work

Medium Potential (orange)
- Areas without attached funding
- Medium to long term focus on feasibility



Fife: waste heat opportunities

Pitfirrane	Frances	Michael
4MWth (est)	2 MWth (est)	1 MWth (est)

- No drilling required – de-risks project
- Exemplar scheme at Seaham (NE England) under construction
- Potential to retrofit existing heat networks

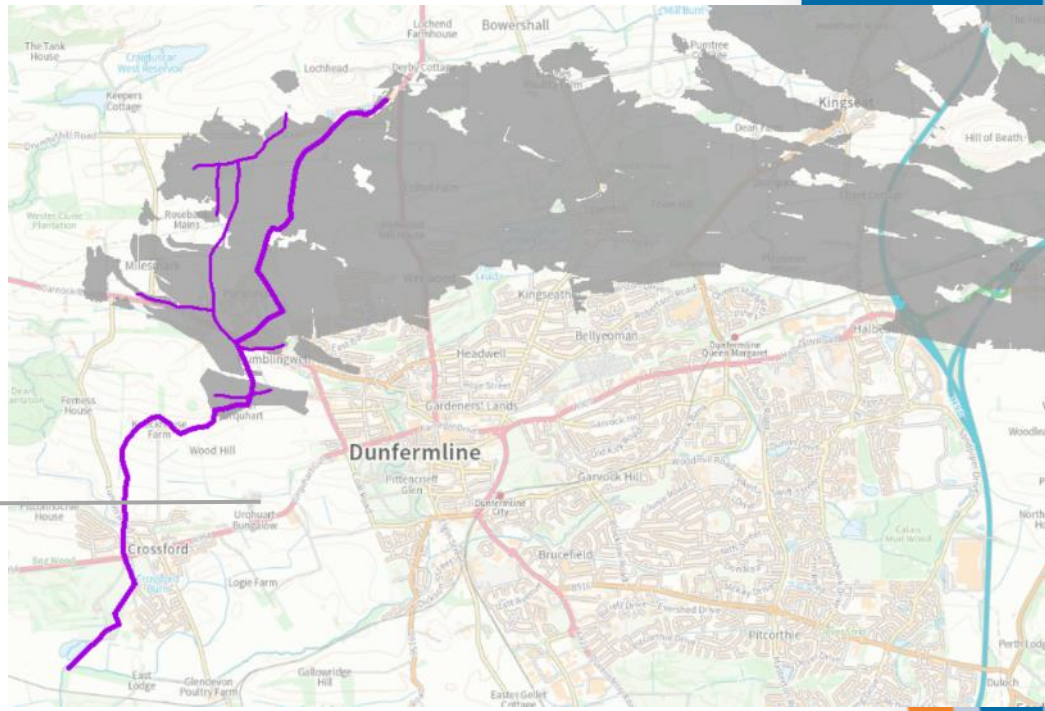
Progressing mine heat opportunities: Pitfirrane/ Dunfermline

Opportunity Map
2024

Pitfirrane MWTS highlighted as potential ~4MW

Pitfirrane Feasibility (desk based)
2025

Next steps…
2025



Thank You

Gareth.Farr@miningremediation.gov.uk

MineWaterHeat@miningremediation.gov.uk

Breakout 2:
Renewable heat from minewater

Martin McGroarty

Lead Professional (Minerals)

Planning Services

Fife Council

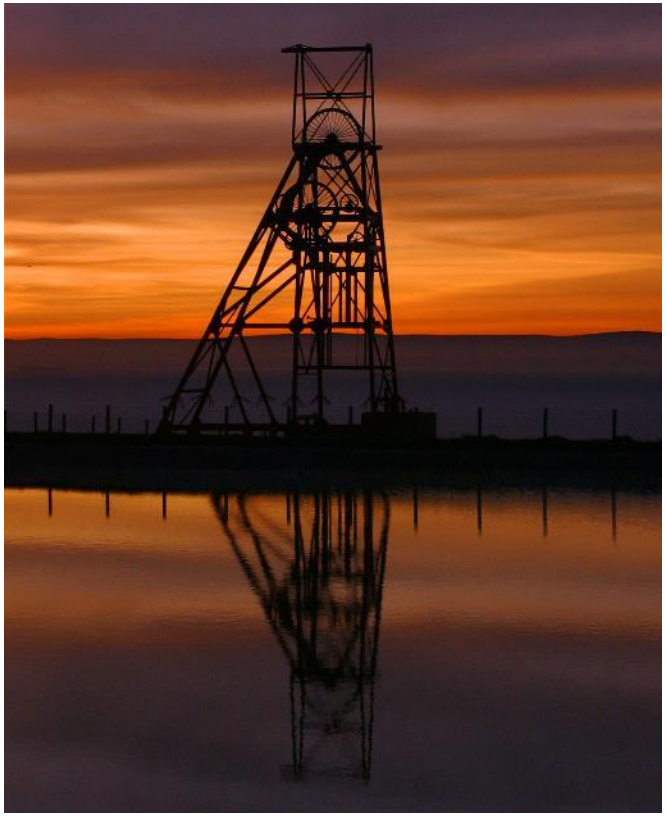
The Legacy of Coal Mining in Fife

Towards a Just Transition

Martin McGroarty

Lead Professional (Minerals)


Daddy Pig
I'm a bit of an expert...



Liaison Role between KDC/Fife Council and The Coal Authority/MRA since early 1990s

Leading on the planning aspects of the Frances Minewater Treatment Facility and the Restoration of Frances Colliery Headframe

Coordinating Council's response to assist the Coal Authority with all mining legacy issues

Subsidence Incidents

Shafts/shallow-workings ”sits” (collapses)

Not all workings/shafts are recorded

Danger to life and property

Usually – but not always – repairable.

Mine Gases

- Blackdamp/Choke Damp/Stythe
  (CO_2-rich/O_2-deficient)
- Whitedamp (mostly CO – Carbon Monoxide)
- Firedamp (CH_4 – Methane)
- Stinkdamp (H_2S – Hydrogen Sulphide)
- Afterdamp
  (combination of gases after underground explosion)

"DAMPF" – German – "steam/vapours"

NHS Lothian

Carbon Dioxide Incident in Gorebridge, Midlothian, April 2014

Final Report of the Incident Management Team

November 2017

64 relatively new homes demolished

Mine Gas Seminar at Scottish Government 2018

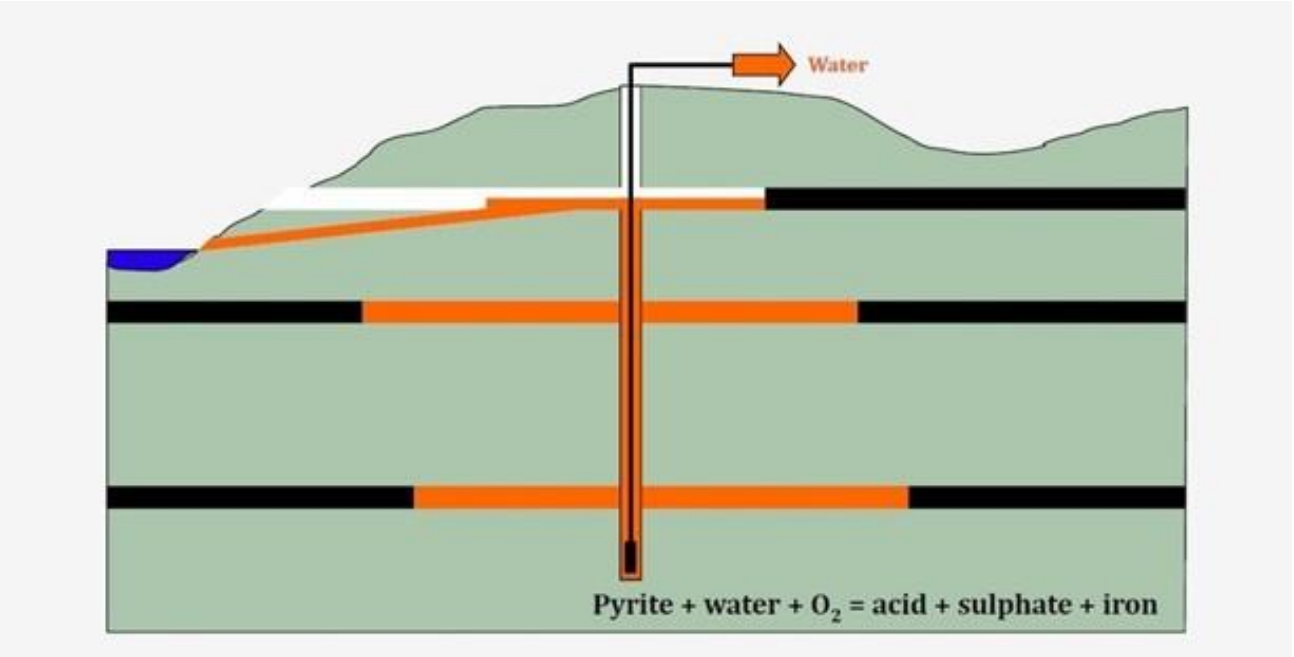
Spontaneous Combustion

Old bings/spoil heaps can burn under the surface

Some shallow coal seams can be prone to spontaneous combustion

Water-flush drilling required

Lochore Meadows Restoration



Mine Water

Water rebounds after pumping stops

Surface breakouts

Ochre is non-toxic but can damage habitats and affect property


POSITIVE
NEGATIVE

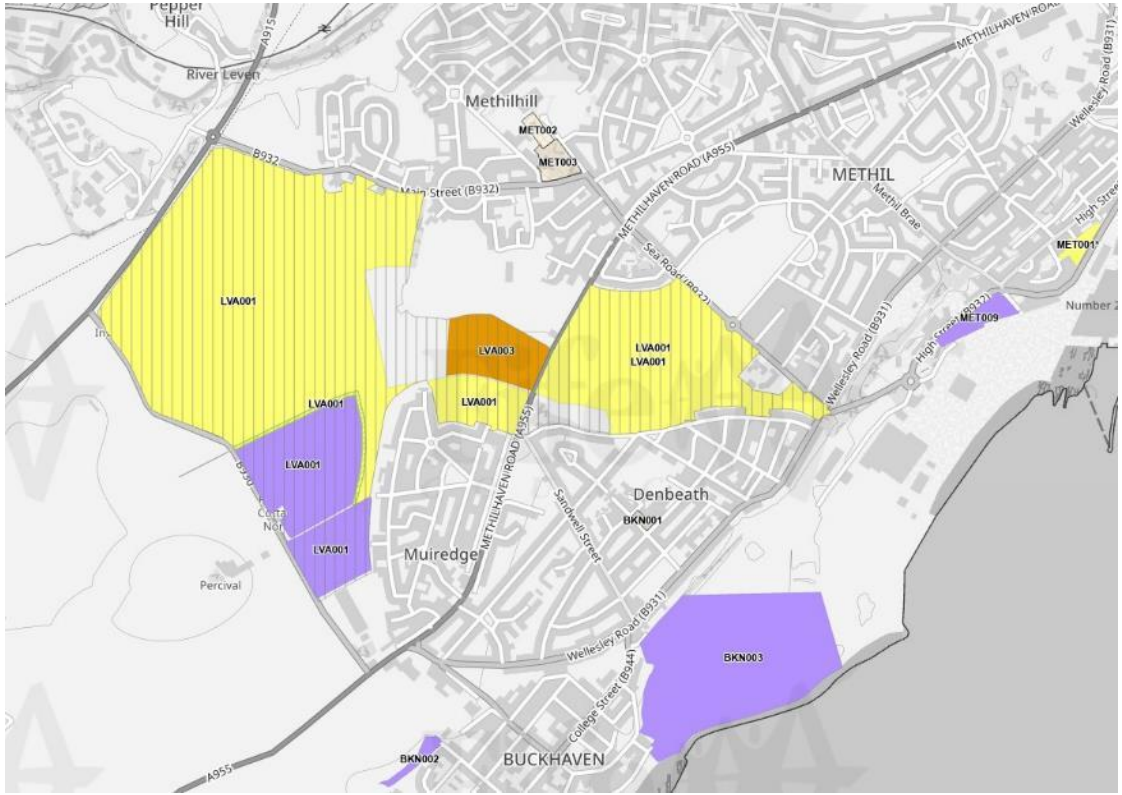

PITFIRRANE


MINTO
5.11.2003

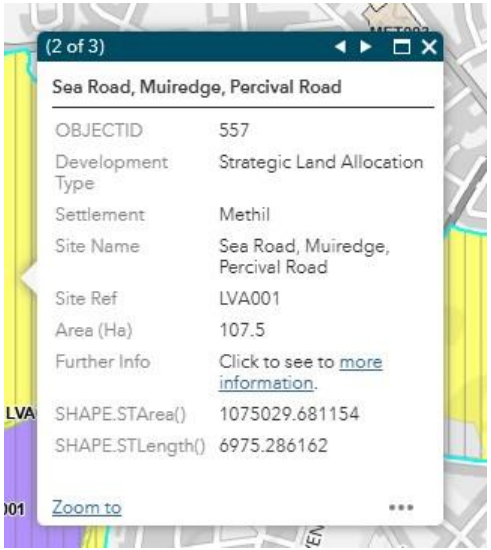

FRANCES

Just Transition

The transition to sustainable energy systems is essential for addressing global climate challenges, and it must be fair and inclusive, ensuring that no one is left behind.



FIFEplan 2017



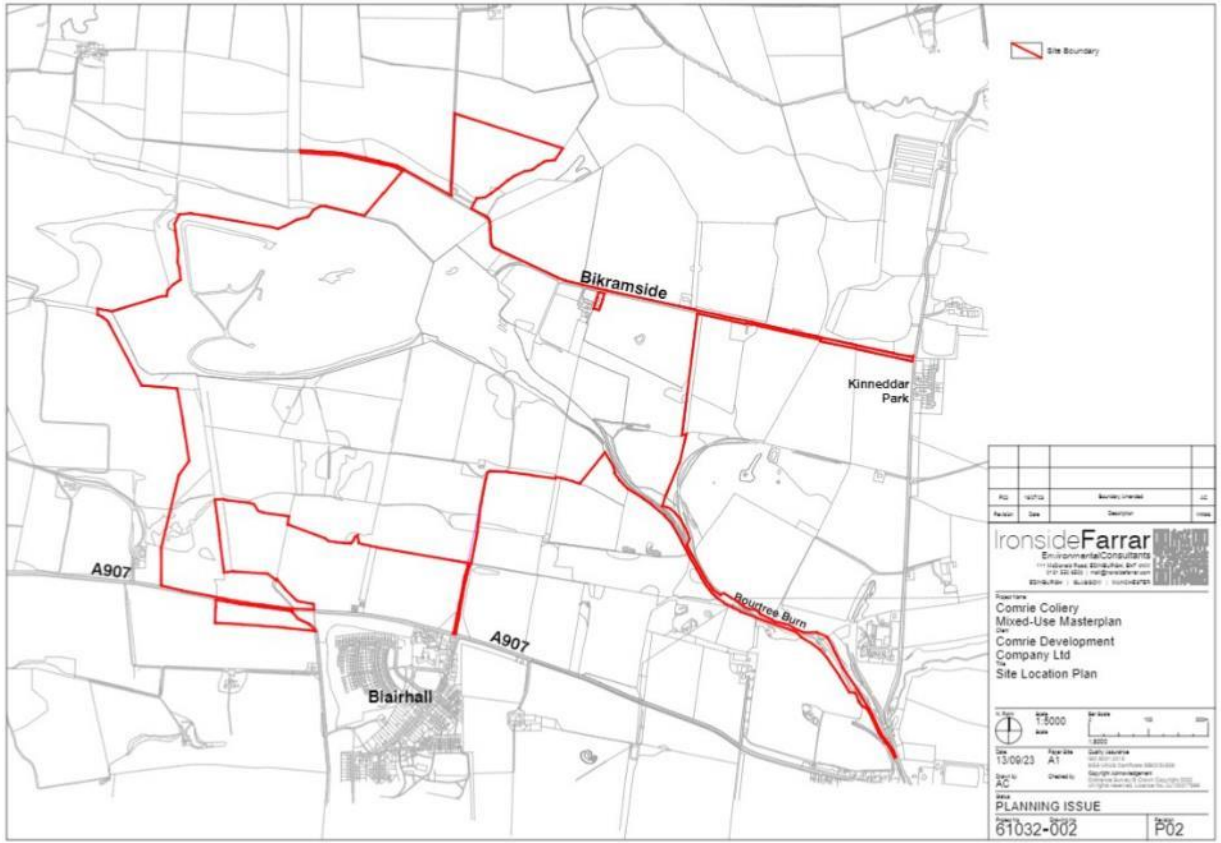
Matching Strategic Land Allocations with former mining areas

located. We also need to be clear about the types of infrastructure we will need to build, and the assets that should be protected to ensure they continue to benefit future generations.

Spatial principles

We will plan our future places in line with six overarching spatial principles:

- **Just transition.** We will empower people to shape their places and ensure the transition to net zero is fair and inclusive.
- **Conserving and recycling assets.** We will make productive use of existing buildings, places, infrastructure and services, locking in carbon, minimising waste, and building a circular economy.



Former Comrie Collery Site

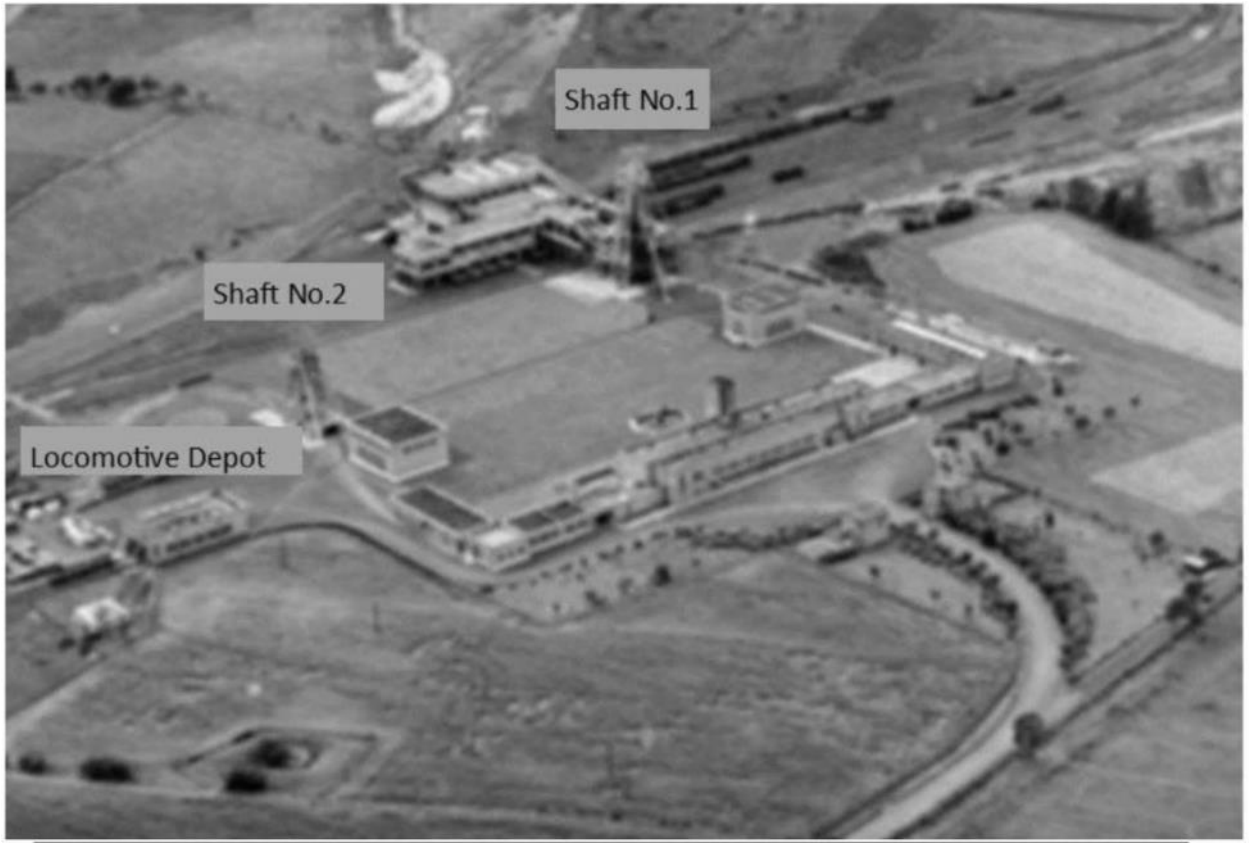
Blairhall, Saline, Comrie, Kinnedar

West Fife

Comrie Colliery 1945

Comrie Colliery 1945

Comrie Colliery 1960



Comrie Colliery 1960

Comrie Colliery 2025

Comrie Colliery Mixed-Use Indicative Masterplan

The Legacy of Coal Mining in Fife

Towards a Just Transition

Martin McGroarty

Lead Professional (Minerals)

Breakout 2:
Renewable heat from minewater

Matthew Jordison

Net Zero Innovation Delivery Officer,
Gateshead Council

Fife Council

Our Climate Matters

Gateshead Council

Engaging Gateshead with Mine Water Heat

Matthew Jordison – Net Zero Innovation Delivery Officer

THRIVE Ambition

- Investment and Economic Development in Gateshead
- Greener Gateshead
- Improved quality of services
- More value for residents and business


Gateshead Council
Mining Remediation Authority
Gateshead College
The Glasshouse
Baltic Centre for Contemporary Art
River Tyne
Reinjection well (High Main seam)
Abstraction wells (Hutton seam)
District Energy Centre
Mine water heat pump
GB Lubricants
Urban solar park

Project Overview

- Technology: 6MW mine water source heat pump.
- Heat Source: Disused coal mines, 150m deep.
- Output: Up to 17 GWh/year.
- Carbon Savings: **~1,252 tCO_2e** annually.
- Beneficiaries: Homes, Gateshead Quays Arena, council buildings.

Opportunities for Local Authorities

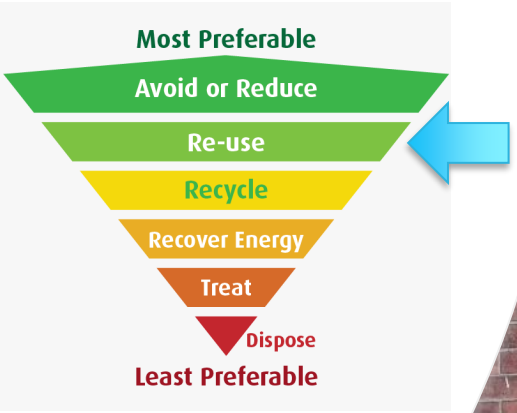
- Decarbonising Heat: Replace unreliable gas heating with renewable heat in LA homes.
- Energy Resilience: Local, stable heat source.
- Economic Growth: Green jobs and infrastructure investment.
- Place-Based Innovation: Turning industrial past into a sustainable future.
- Net Zero Compliance: At least 75% of heat input from renewable sources.

Key Achievements

- UK’s largest mine water heat scheme.
- Integrated with solar power for renewable electricity.
- £9.9M in government funding secured.
- Model for other councils and urban areas with mining heritage.

Customer Key Achievements

- Community Engagement
- IT'S NOT ABOUT US
- Less green, More common sense
- My home, My interests
- Happy & receptive residents.

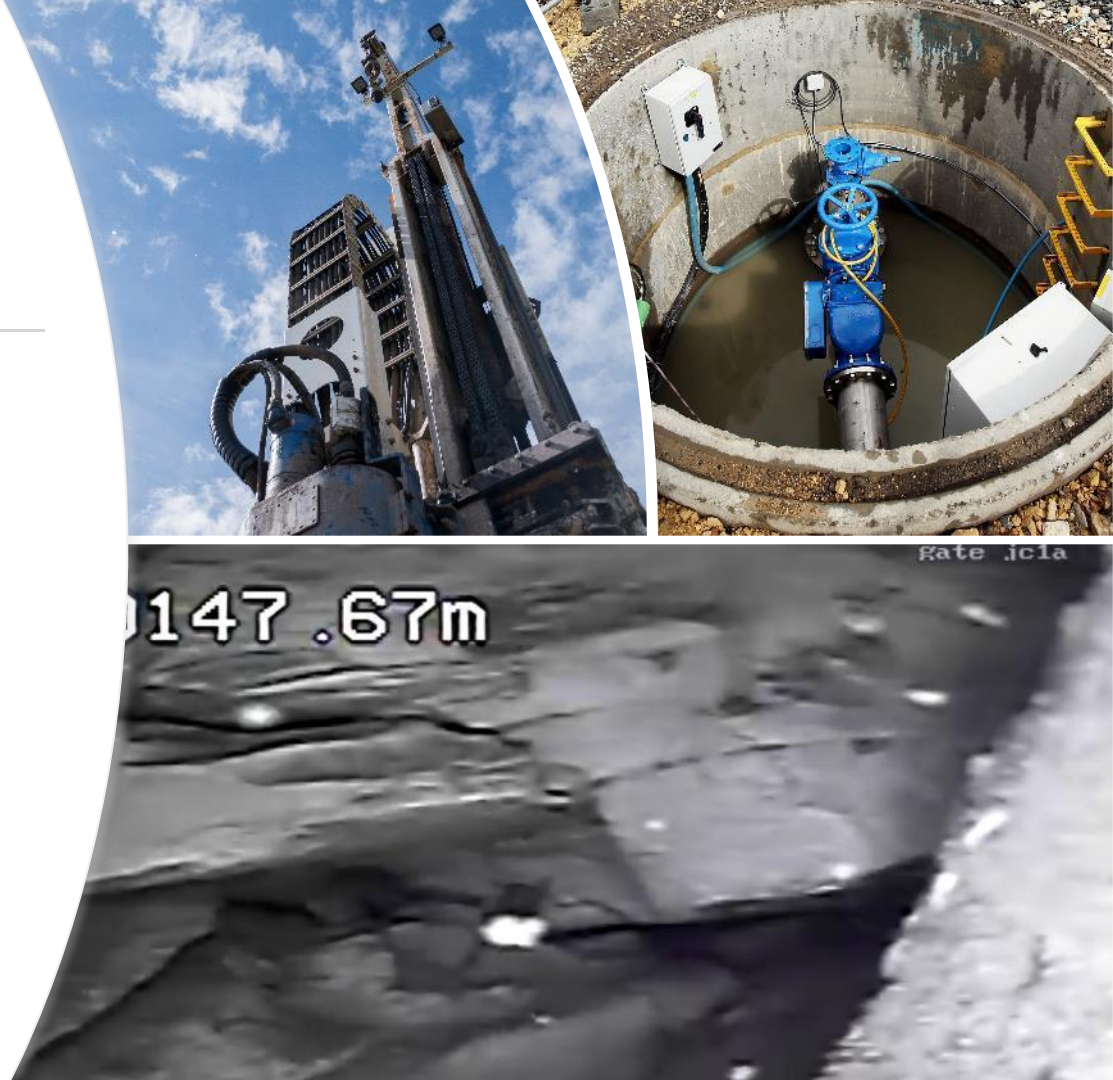


Above-Ground Structures Requirements

- Energy Centre: Compact design housing heat pump, control systems, and thermal storage.
- Solar PV: 4MW installed on brownfield sites.
- Why It Matters: Ideal for dense urban environments or brownfield regeneration sites.

Challenges to Consider

- Geological risks: Borehole drilling can be unpredictable.
- Regulatory complexity: Multiple permits and environmental assessments.
- Upfront costs: But long-term operational savings.
- Specialist skills: Need for technical and operational expertise.
- Public perception: Clear communication is essential.



Technical Learnings

- Borehole Siting and Drilling: Detailed geological surveys and thermal modelling.
- Compact Energy Centre Design: Small footprint ideal for urban environments.
- Heat Pump Commissioning: Extensive testing for performance and efficiency.
- Permitting and Regulation: Early engagement with regulators.
- Integration with Renewable Electricity: Solar PV helps meet net zero threshold.
- Thermal Storage and Network Design: Critical for balancing supply and demand.
- **Operational Strategy: Dynamic utility pricing influences operation.**
- **RHI Support: Act quickly to secure remaining RHI support.**
- **Not using the centre full time.**

Final Thoughts

- Gateshead's scheme is a replicable model.
- Mine water heat is a powerful tool in the net zero toolkit.
- With the right partnerships and planning, local authorities can lead the way.
- GET IT DONE!

Warmer days are ahead... THANKS FROM GATESHEAD

Audience Q&A

Lunch

13:00 – 13:50

Fife – A Place for Energy

Exploring Fife's innovative approach to the energy transition through our Big Energy Move

Fife Council

Our Climate Matters