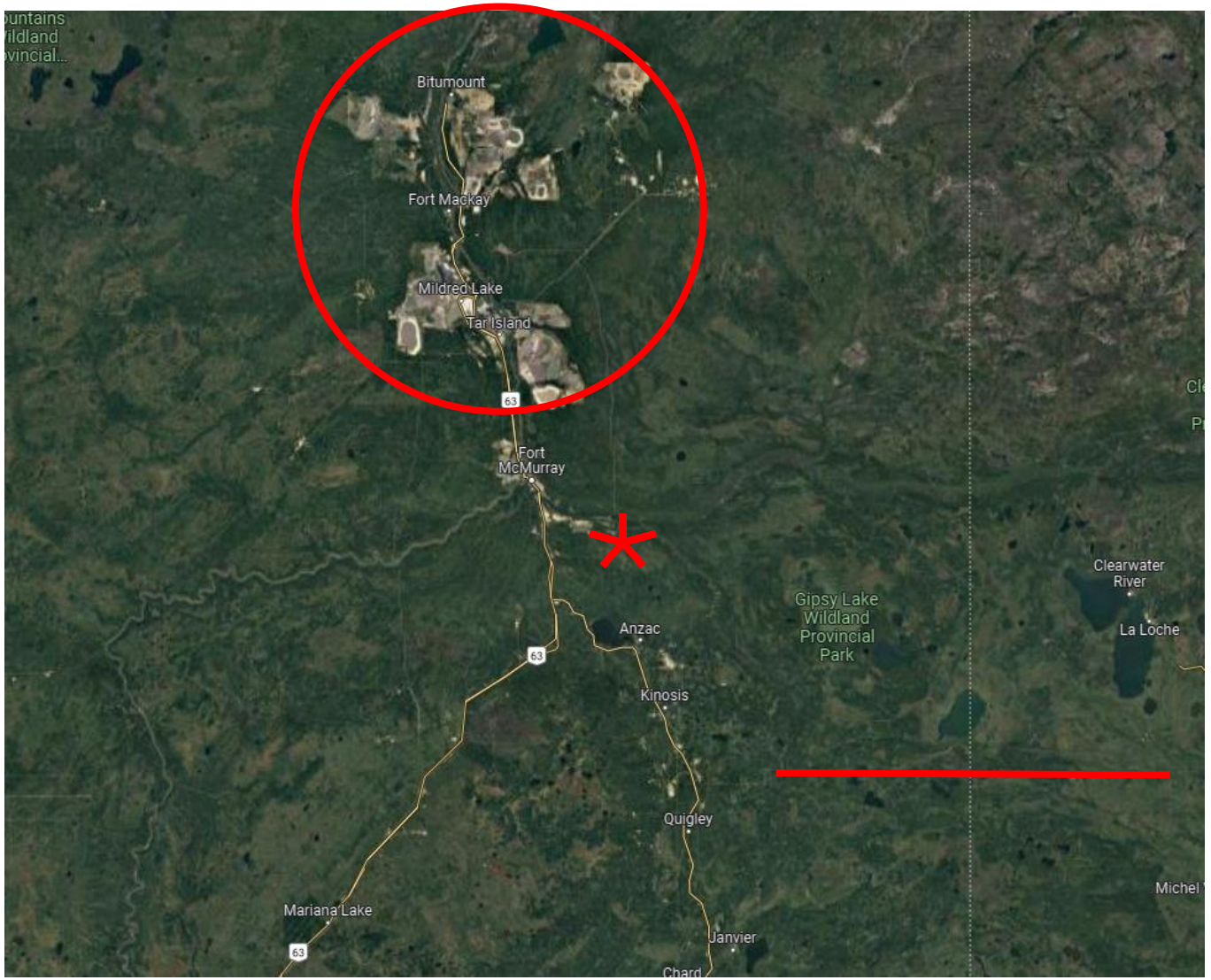
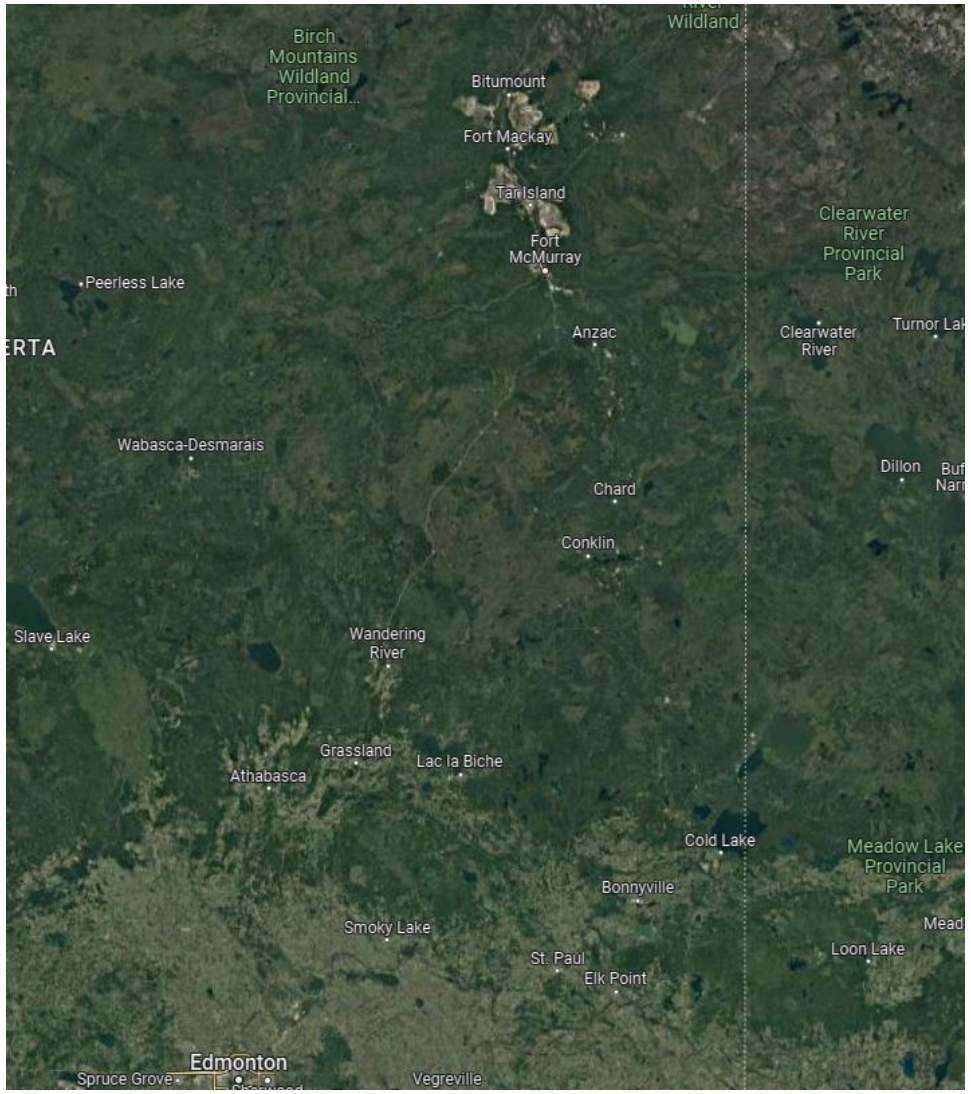
NPUC WORKSHOP
ADVANCES IN BITUMEN PROCESSING

May 26, 2022

Context: Fort McMurray Area

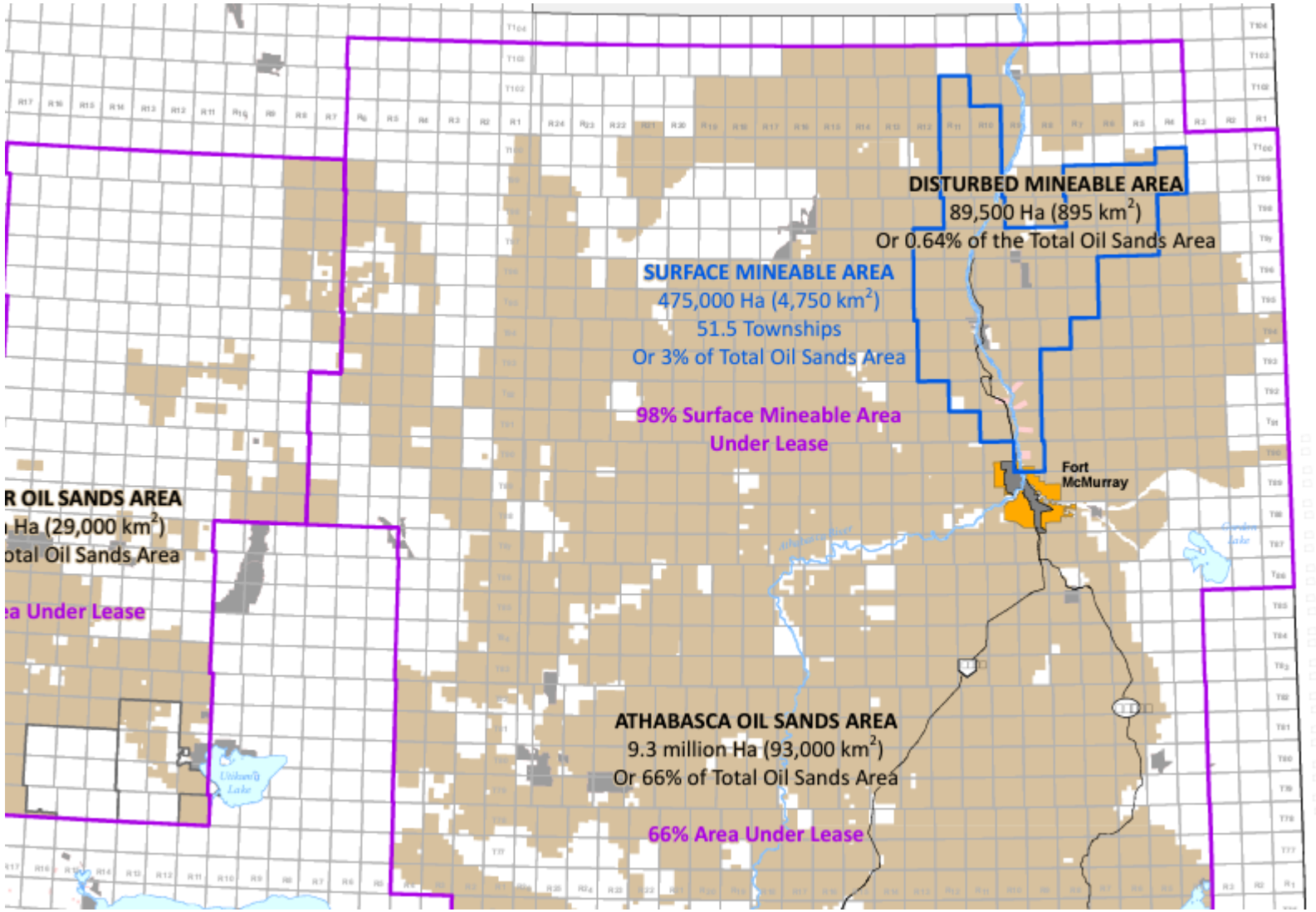




Isolated and long transportation hauls for products and construction materials and workers, Productivity

Present Structure vs Future Opportunity

Present structure of the industry has a mass of production at the mine sites with upgraders, which has facilitated shipping from other nearby sites with locally sourced “diluents”. There are also a selection of pipelines that move gaseous products, trucking and rail. This is going to change over the next 35 years, creating either more urgency about other options, or more problems for new facilities in terms of infrastructure. Some of the facilities in existence may be pressed into alternative service once the mines are expended for example hydrogen production and CO2 receiving hubs, shipping centers, generating stations, secondary industry.



Tomorrow does not = Today, opportunities change and develop

Exiting Technology

Products

- Sweet Synthetic Crude
- Sour Synthetic Crude Blends
- Sour Synthetic Crude Cuts
- Dilbit – SAGD, Paraffinic
- Synbit – SAGD
- SolBit – Paraffinic
- Diesel
- Residue Cuts

By-products

- Sulfur
- Gases/light olefins
- CO2
- Hydrogen
- Electricity

Newish Technology

Products

- DilCuts
- Cuts
- Bitumen Pucks and Pellets

By-products

- Ammonium Sulfate
- Butane
- CO2
- Hydrogen
- Electricity
- Heavy mineral concentrates (Ti, Zircon, Rare Earths, Thorium)
- Clays
- Sand
- Asphalt, asphalt feedstocks
- Salts

What can we see right now

Material for Sale: Success Criteria

- Transport of material to market, must leave room to make profit
- Must make sense to build in Fort McMurray – cost for materials and workers to construct – everything brought in
- Material manufacture must be from obtainable streams and additives – nothing exotic need be obtained from away
- Ideally, production facilities are “off-campus” for specialty products – such that the complexities of the site operations do not interfere with material productions and such that the material production facilities and activities do not interfere with the sites
- Administration of GHG credits is important
- Handling of waste materials is important
- Keep process complexity and supply chain complexity minimized

Oil/Energy Companies are focused on just that, What can you do beyond, Who can do beyond?

Beyond Bitumen Combustion

- Carbon Fiber
- Graphene
- Graphite
- Structural carbonaceous filler
- Carbonaceous Insulation
- Lubricants
- Activated carbon
- Nuclear Diamond
- Polymer additives
- Emulsion additives
- Asphalt

Partial Upgrading

- Hydrogenation without hydrogen plant
- Recombination of overly light (butane) and overly heavy (asphaltene) streams
- Minimal byproducts or
- Usable byproducts or
- Valuable byproducts
- Low energy visbreaking, recombinant chemistry
- Pipelinable or readily shippable bulk products

Other byproducts

- Salt mixtures
- Mineral concentrates
- Aggregate, sand and clay
- Sulfur compounds
- Radioactives
- Coke products
- Fly ash

What could be next – you tell us – Edmonton/Heartland Context is different