



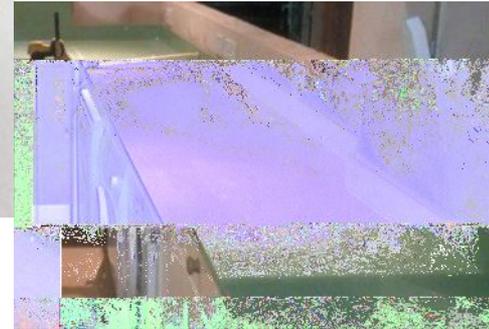
Alternative Minerals– Potential for Guyana (Part 3)

Rickford Vieira,
Commissioner,
Guyana Geology and Mines Commission
9th September 2014



Green Quartz– Uses

- ▶ Green quartz has been used as counter tops, jewelry, gemstone and as other ornamental and religious objects.





Picture showing Green Quartz found in Guyana



Location: Torres Hill Near Aishalton, South Rupununi

Best Field Indicator :

Hardness : 7
Colour : Green, light green
Streak : White

*** Note: Hardness: 1 is lowest and 10 is highest.



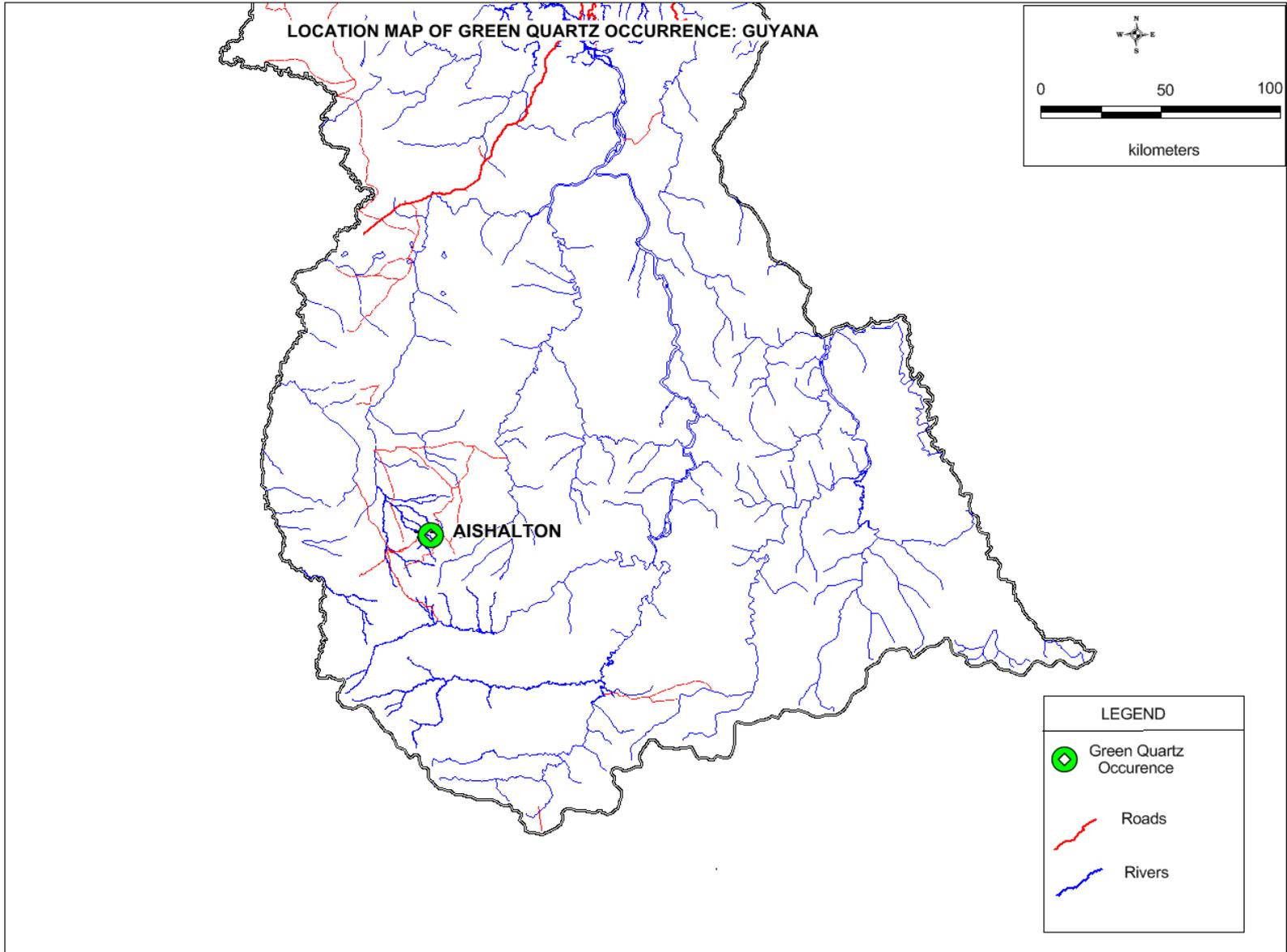
Green Quartz– Uses

- ▶ Green quartz has been used as counter tops, jewelry, gemstone and as other ornamental and religious objects.





Map of Guyana showing Green Quartz location



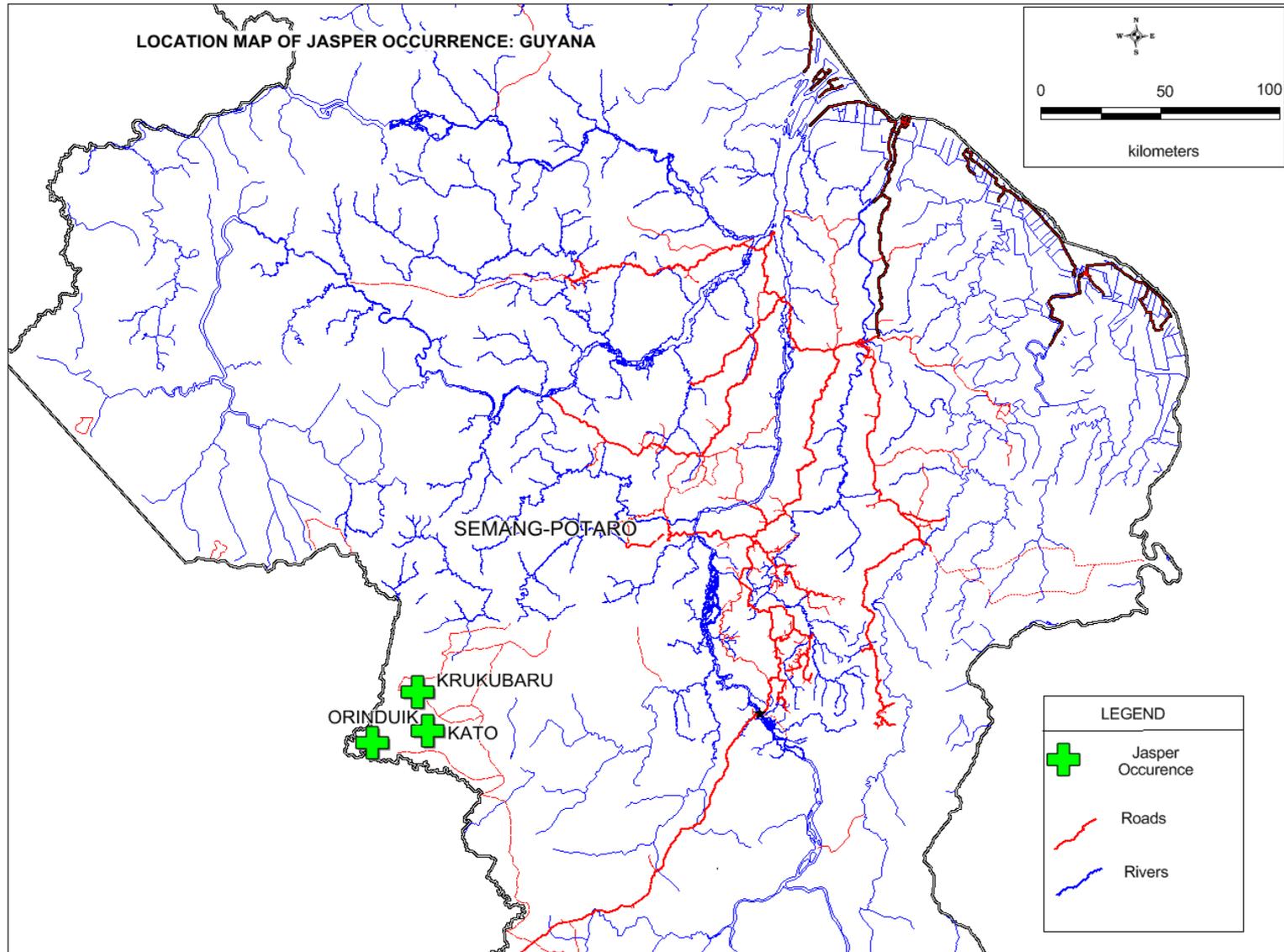


Jasper – Facts and Formation

- ▶ Jasper is a dense, opaque, microcrystalline variety of Quartz. Fibrous and grainy varieties of Quartz are often grouped together and referred to as Chalcedony, though Jasper's microcrystals are laid out in large, sugar-like grains rather than the fibrous layers of Chalcedony or Agate.
- ▶ It occurs in nodules or as fillings in fissures and may be found all over the world, in nearly every color. Jasper is colored by oxides of iron and known for its deep earthy tones of red, yellow, brown and green, sometimes in shades of blue or purple, and displays wonderful contrasts in its banding, inclusions, “pictures,” and small circular patterns.



Map of Guyana showing Jasper location





Pictures showing Jasper found in Guyana



Location: Near Orinduik Falls (Pakaraima Mountains)

Best Field Indicator :

Hardness : 6.5 to 7

Colour : Red, Yellow or Brown



Jasper - Uses

- ▶ Jasper is primarily used today as ornamental jewelry used to create sculptures, construction and ornaments.





Rutile – Facts and Formation

- Rutile is the most common form of titanium dioxide. Rarer polymorphs include Brookite and Anatase, both which also form unique and distinctive crystals.
- Rutile is a mineral that comes in a surprising contrast of distinct habits and colors, making it a fascinating mineral.
- Rutile has multiple unique crystal forms as well as several telltale colors, styles, and associations.



Rutile – Facts and Formation

- ▶ It ranges from mirror-like metallic lustered crystals, to dark reddish sub-metallic crystals, to bright golden-yellow needles.
- ▶ Even the opaque metallic-looking forms are somewhat translucent on edge under backlighting, with a dark red translucent tinge.
- ▶ Rutile comes in several different environments, including plutonic and intrusive igneous rocks and granites, metamorphic gneiss and schists, carbonatites, regional metamorphic schists, and hydrothermal replacement deposits.



Pictures showing Rutile





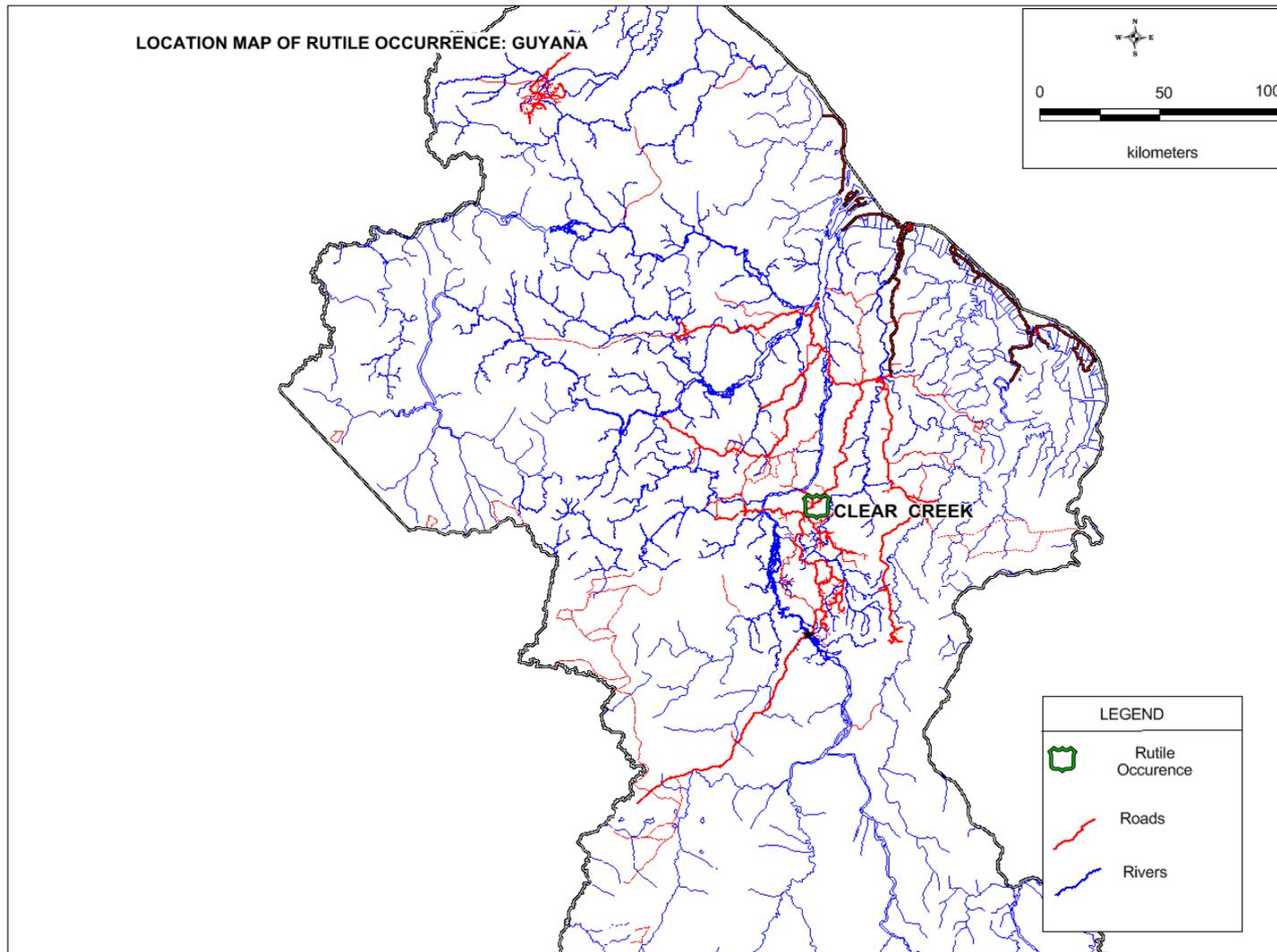
Rutile – Uses

- ▶ Welding rods
- ▶ Jewellery
- ▶ Paints





Map of Guyana showing Rutile location





Black Pearl – Facts and Formation

- ▶ The Black Pearl, originally Wicked Wench, is a fictional ship in the Pirates of the Caribbean film series. In the screenplay, the Black Pearl is easily recognized by her distinctive black hull and sails.
- ▶ Black Pearl beads of high quality, famed for their roundness, high luster and the eye-catching silver jewelry creations they produce when set in rings, earrings, pendants and much more.
- ▶ Black pearl beads can be drilled and strung or pasted on to jewelry mounts.



Black Pearl – Uses

- ▶ Jewelry
- ▶ Cosmetics

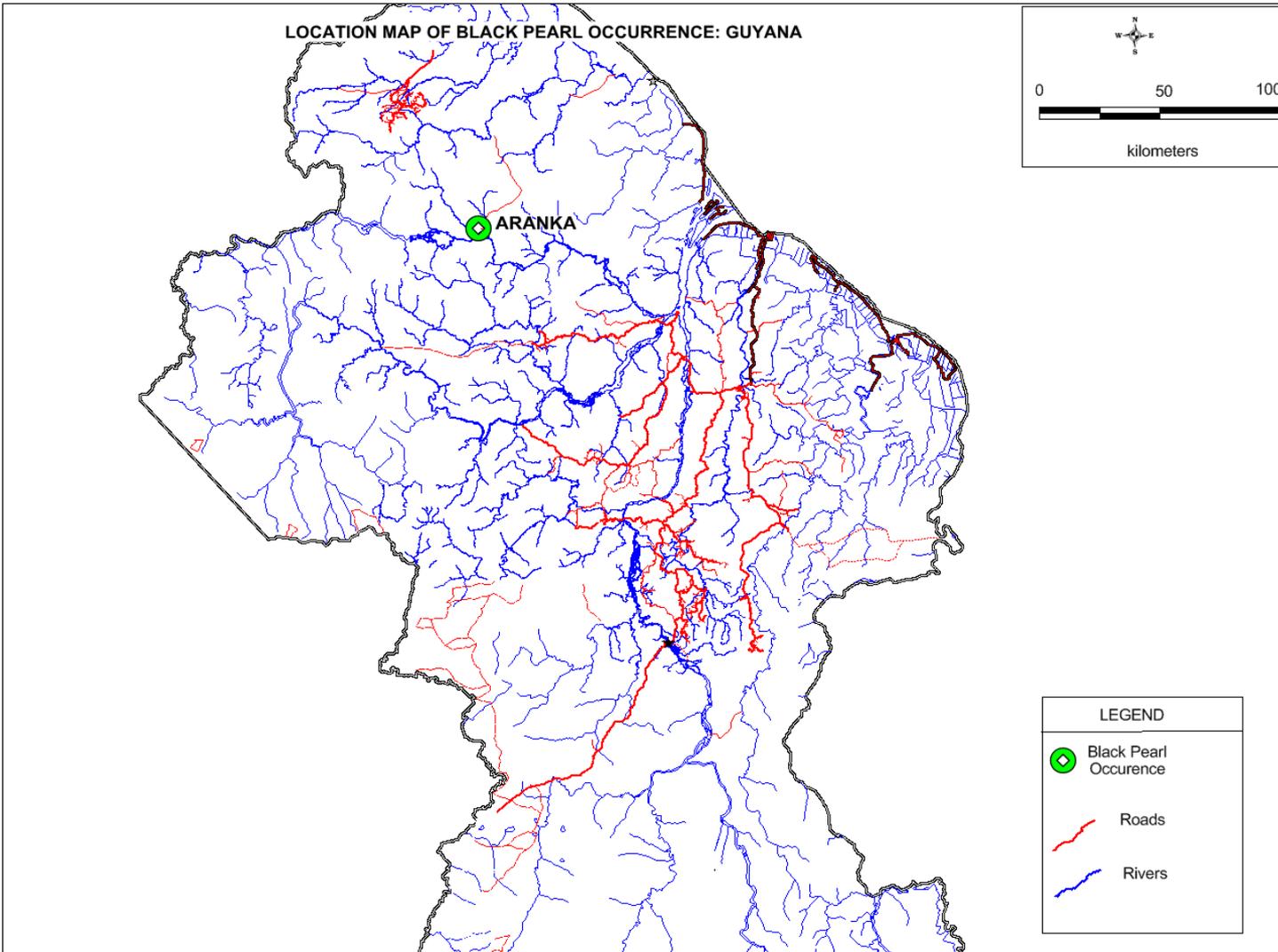


Pictures showing Black Pearl





Map showing Black Pearl location in Guyana





RARE EARTH ELEMENTS

Z	ELEMENT	SYMBOL	USE
21	Scandium	Sc	Aerospace framework, high-intensity street lamps, high performance equipment
39	Yttrium	Y	TV sets, cancer treatment drugs, enhances strength of alloys
57	Lanthanum	La	Camera lenses, battery-electrodes, hydrogen storage
58	Cerium	Ce	Catalytic converters, colored glass, steel production
59	Praseodymium	Pr	Super-strong magnets, welding goggles, lasers
60	Neodymium	Nd	Extremely strong permanent magnets, microphones, electric motors of hybrid automobiles, laser
61	Promethium	Pm	Not usually found in Nature
62	Samarium	Sm	Cancer treatment, nuclear reactor control rods, X-ray lasers
63	Europium	Eu	Color TV screens, fluorescent glass, genetic screening tests
64	Gadolinium	Gd	Shielding in nuclear reactors, nuclear marine propulsion, increases durability of alloys
65	Terbium	Tb	TV sets, fuel cells, sonar systems
66	Dysprosium	Dy	Commercial lighting, hard disk devices, transducers
67	Holmium	Ho	Lasers, glass coloring, High-strength magnets
68	Erbium	Er	Glass colorant, signal amplification for fiber optic cables, metallurgical uses
69	Thulium	Tm	High efficiency lasers, portable x-ray machines, high temperature superconductor
70	Ytterbium	Yb	Improves stainless steel, lasers, ground monitoring devices
71	Lutetium	Lu	Refining petroleum, LED light bulbs, integrated circuit manufacturing

(Z = Atomic Number)

- Elements 29, 61 = Rare Earths
- Elements 57 - 60, 62 = Light Rare Earth Elements
- Elements 39, 63 - 71 = Heavy Rare Earth Elements

A LIST OF ALL RARE EARTH ELEMENTS



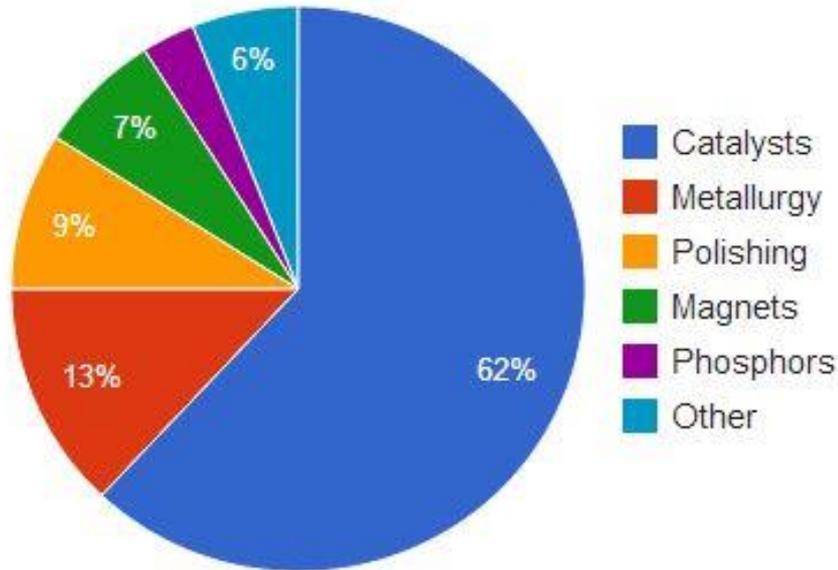
USES AND FACTS

- ▶ Many rechargeable batteries are made with rare earth compounds.
- ▶ Demand for the batteries is being driven by demand for portable electronic devices such as cell phones, readers, portable computers, and cameras.
- ▶ Several pounds of rare earth compounds are in batteries that power every electric vehicle and hybrid-electric vehicle.
- ▶ Rare Earth Elements make the world's strongest permanent magnets, these magnets are utilized in electric motors
- ▶ Rare earths are used as catalysts, phosphors, and polishing compounds. These are used for air pollution control, illuminated screens on electronic devices, and the polishing of optical-quality glass.



USES AND FACTS

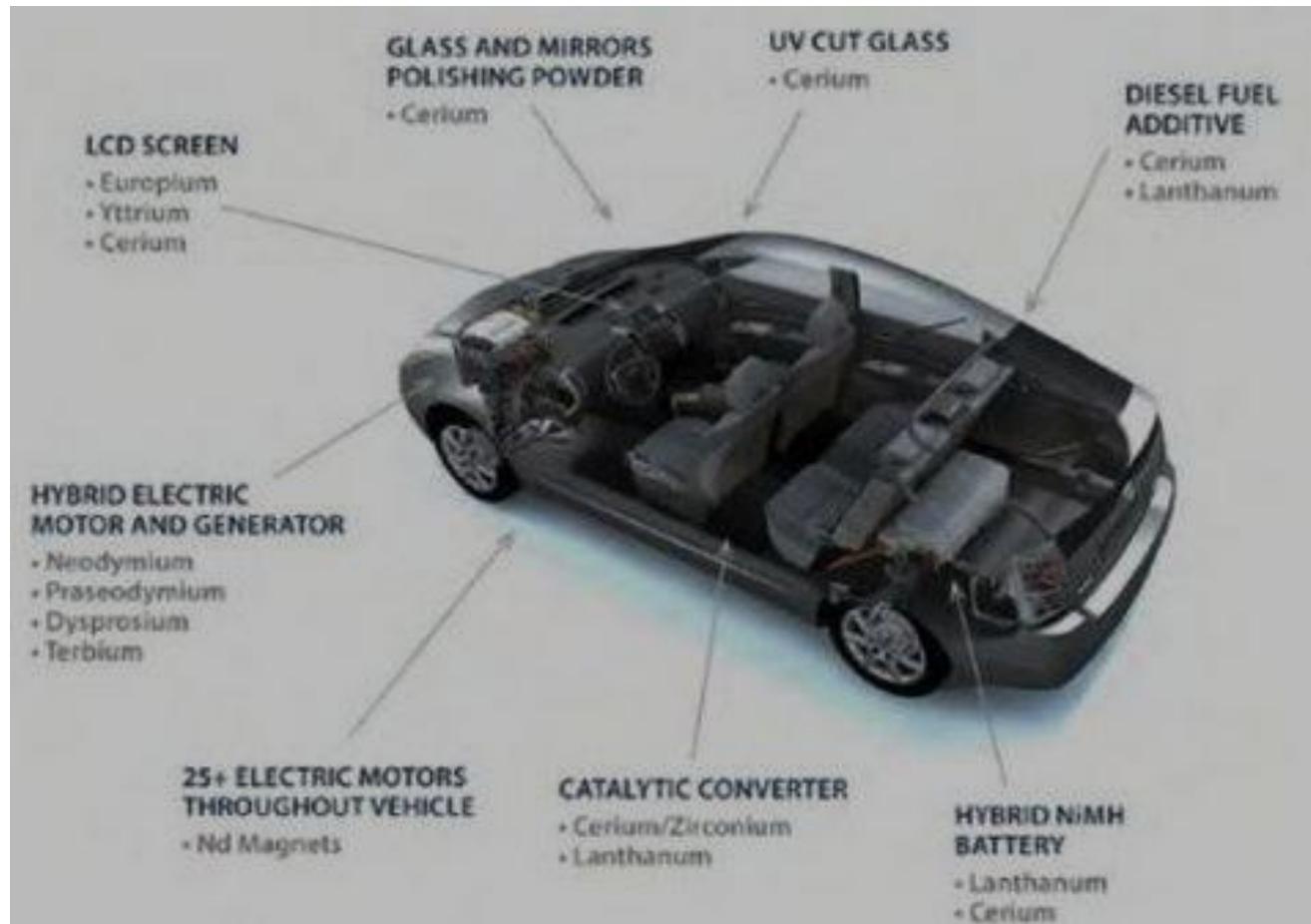
Uses of Rare Earth Elements



USES IN THE USA AS REPORTED BY THE UNITED STATES GEOLOGICAL SURVEY MINERAL COMODITY SURVEY, 2012

REF: <http://geology.com/articles/rare-earth-elements/>

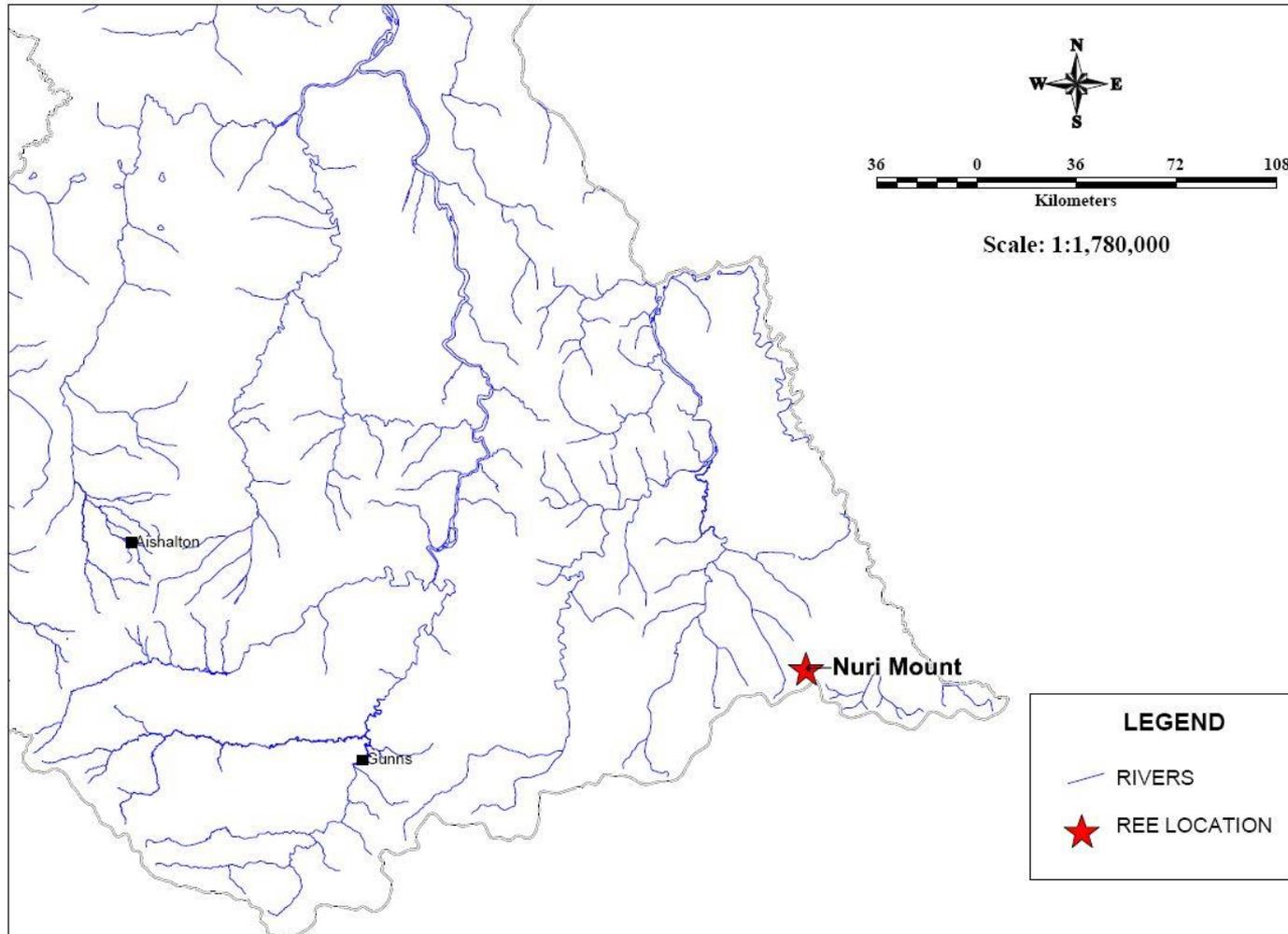
USES OF REEs



RARE EARTH ELEMENTS ARE USED EXTENSIVELY IN HYBRID CARS



PROBABLE REE OCCURANCE IN GUYANA





PEAT



PEAT IS USED TO MAKE ORGANIC COMPOSTE
FOR AGRICULTRUAL PURPOSES

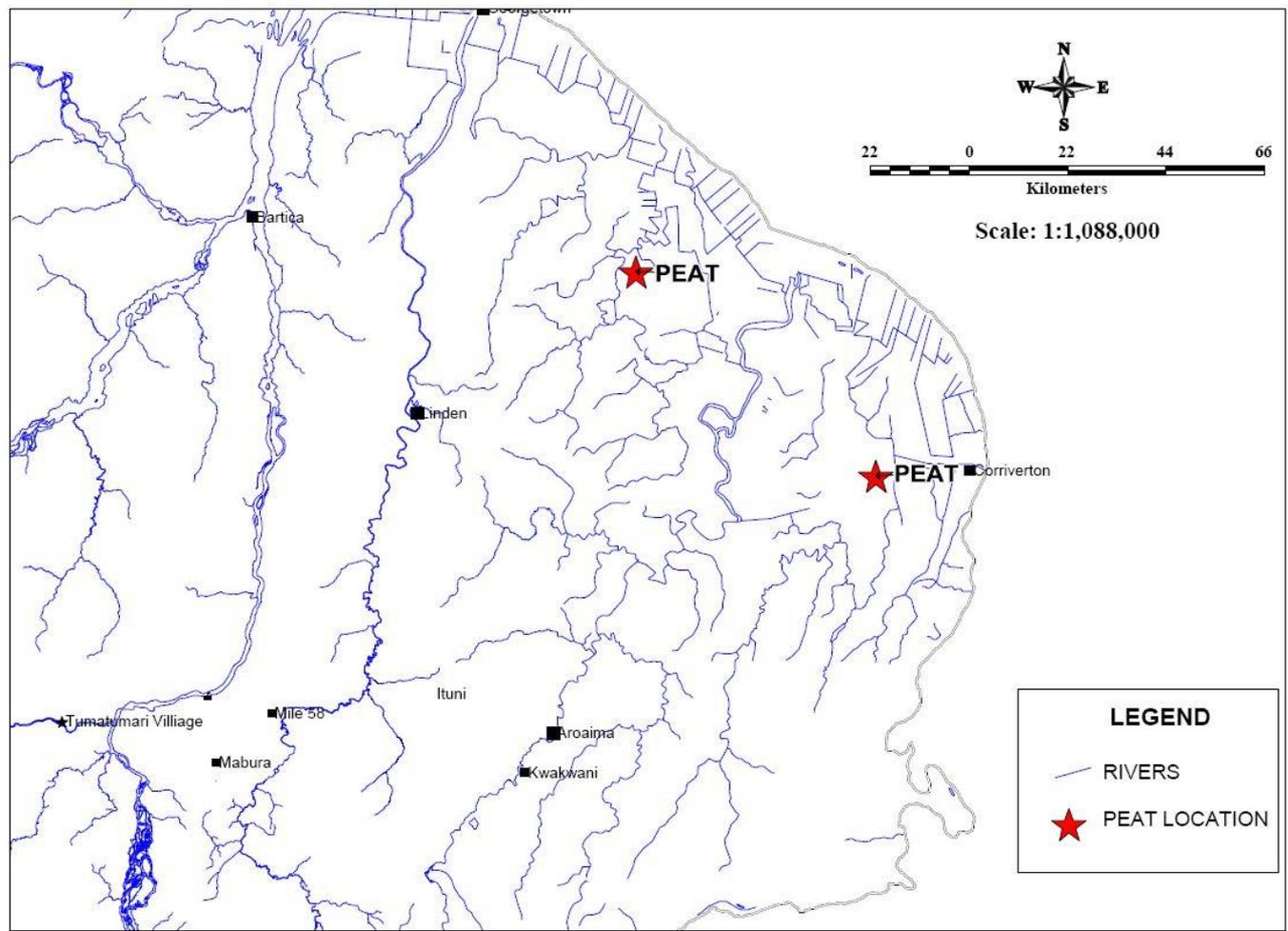


USES AND FACTS OF PEAT

- ▶ Farmers and gardeners mix peat into soil to improve its structure and to increase acidity.
- ▶ It retains moisture in soil when it is dry yet preventing the excess of water from killing roots when it is wet.
- ▶ Peat can store nutrients although it is not fertile itself.
- ▶ In addition to being soft in texture and therefore suitable for demersal (bottom-dwelling) species such as *Corydoras* catfish, peat is reported to have a number of other beneficial functions in freshwater aquaria.
- ▶ It softens water by acting as an ion exchanger; it also contains substances that are beneficial for plants, and for the reproductive health of fishes.
- ▶ It can even prevent algae growth and kill microorganisms.
- ▶ Peat is used in water filtration, such as for the treatment of septic tank effluent, as well as for urban runoff. Due to its purifying properties, peat also serves as a filter for septic tanks, as well, may be used as a water purifier.
- ▶ Many traditional spa treatments include peat as part of peloids. The most common types of peat application in balneotherapy are peat muds, poultices, and suspension baths.



PEAT OCCURRENCES IN GUYANA





SILICA SAND





USES AND FACTS OF SILICA SAND

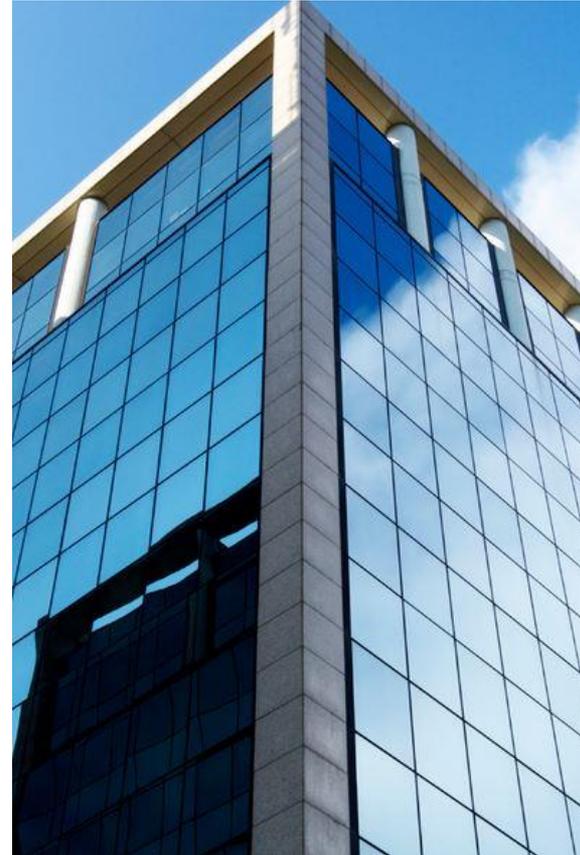
- ▶ Sands are used in the glassmaking industry. Silica sand is used in the production of container glass, flat plate glass, specialty glass and fiberglass.
- ▶ it is an excellent abrasive material given a hardness of seven on the Mohs' Scale. Silica sands are used for sand blasting, scouring cleansers, grinding media, and grit for sanding and sawing.
- ▶ It is used extensively in the construction industry to fill voids and in concrete work.
- ▶ Refractory brick are often made of silica sand because of its high heat resistance. Silica sand is also used as a flux in the smelting of metals.
- ▶ In the petroleum industry sand slurries are forced down oil and gas wells under very high pressures. This high pressure fractures the reservoir rocks and the sandy slurry injects into the fractures holding the fractures open after the pressure is released.
- ▶ Silica sand is used as a filler in the manufacture of rubber, paint and putty. Silica sands are used for traction in the railroad and mining industries.



USES OF SILICA SAND



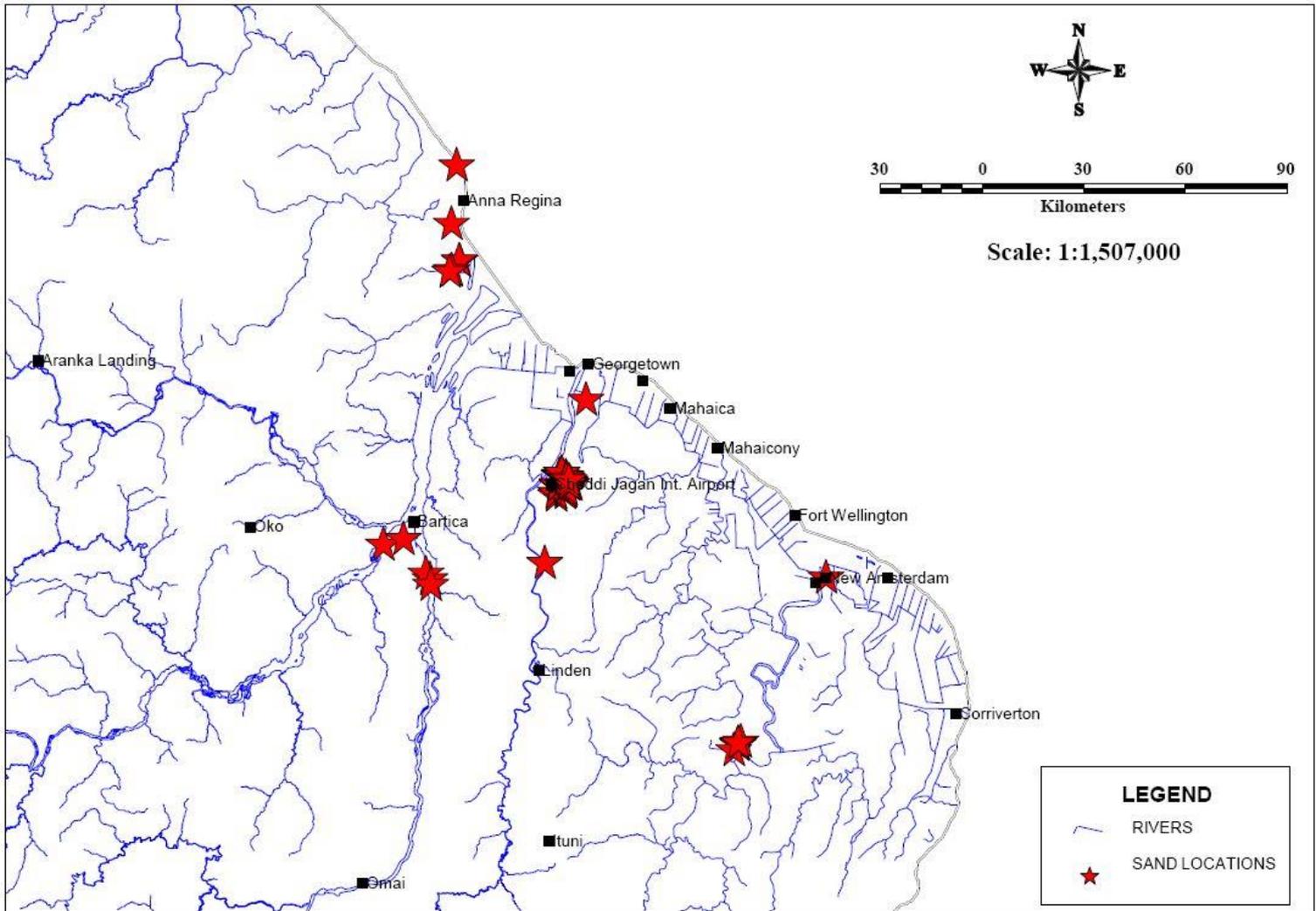
GLASS BOTTLES



**CONSTRUCTION GLASS
FOR BUILDINGS**



SILICA SAND OCCURRENCES IN GUYANA





Uranium Facts and Formation

- ▶ The Aricheng South uranium occurrence is associated with Na metasomatism that affected the granitoids of the Kurupung Batholith in western Guyana.
- ▶ A minor amount of uraninite occurs in fractures in the newly formed albite crystals, often in company of calcite.



Uranium – Uses

- ▶ The main use of uranium in the civilian sector is to fuel nuclear power plants
- ▶ Uranium are used in small amounts for yellow glass and pottery glaze
- ▶ Use as toner in photography
- ▶ Use in the leather and wood industries for stains and dyes.



Uranium – Uses

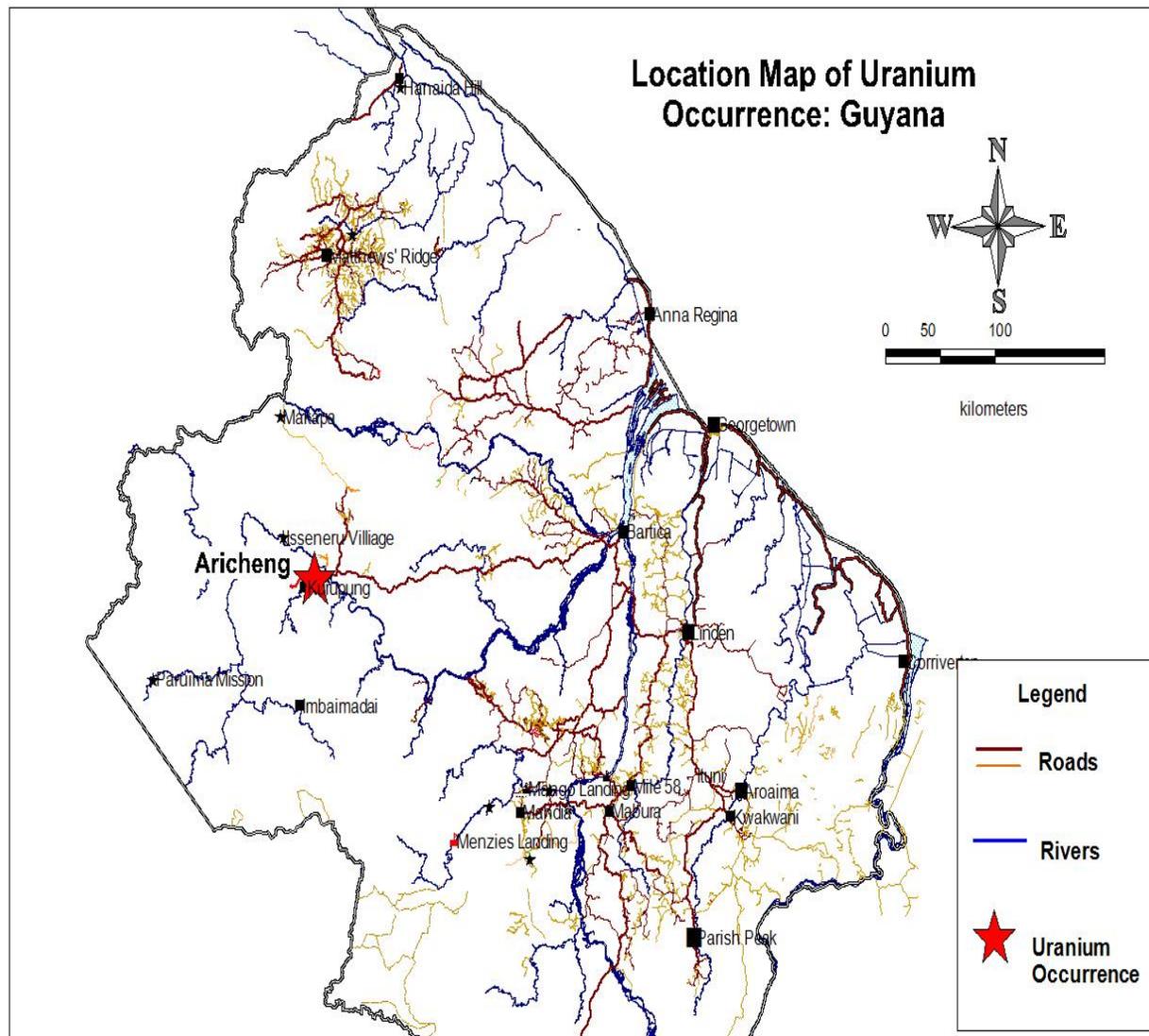


Nuclear Power Plant



Glow in the Dark

Uranium Occurrence in Guyana





PGMs Facts and Formation

- ▶ There is a potential for Platinum Group Metals in two area namely Kaburi and Tappa
 - The Kaburi Anorthosite
 - Tappa Gabbroic Rock
 - (Potarites were found in Potaro River)



PGMs – Uses

- ▶ Three-way catalyst (TWC) compositions employ platinum, palladium, and/or rhodium for the abatement of emissions from petrol/rich-burn engines.
- ▶ Platinum and Palladium are used in the jewellery industry
- ▶ PGMs are used extensively in the chemicals sector as catalysts.
- ▶ Also use in electronic, electrical, glass, medicine and automotive



PGMs – Uses



Three way Catalyst



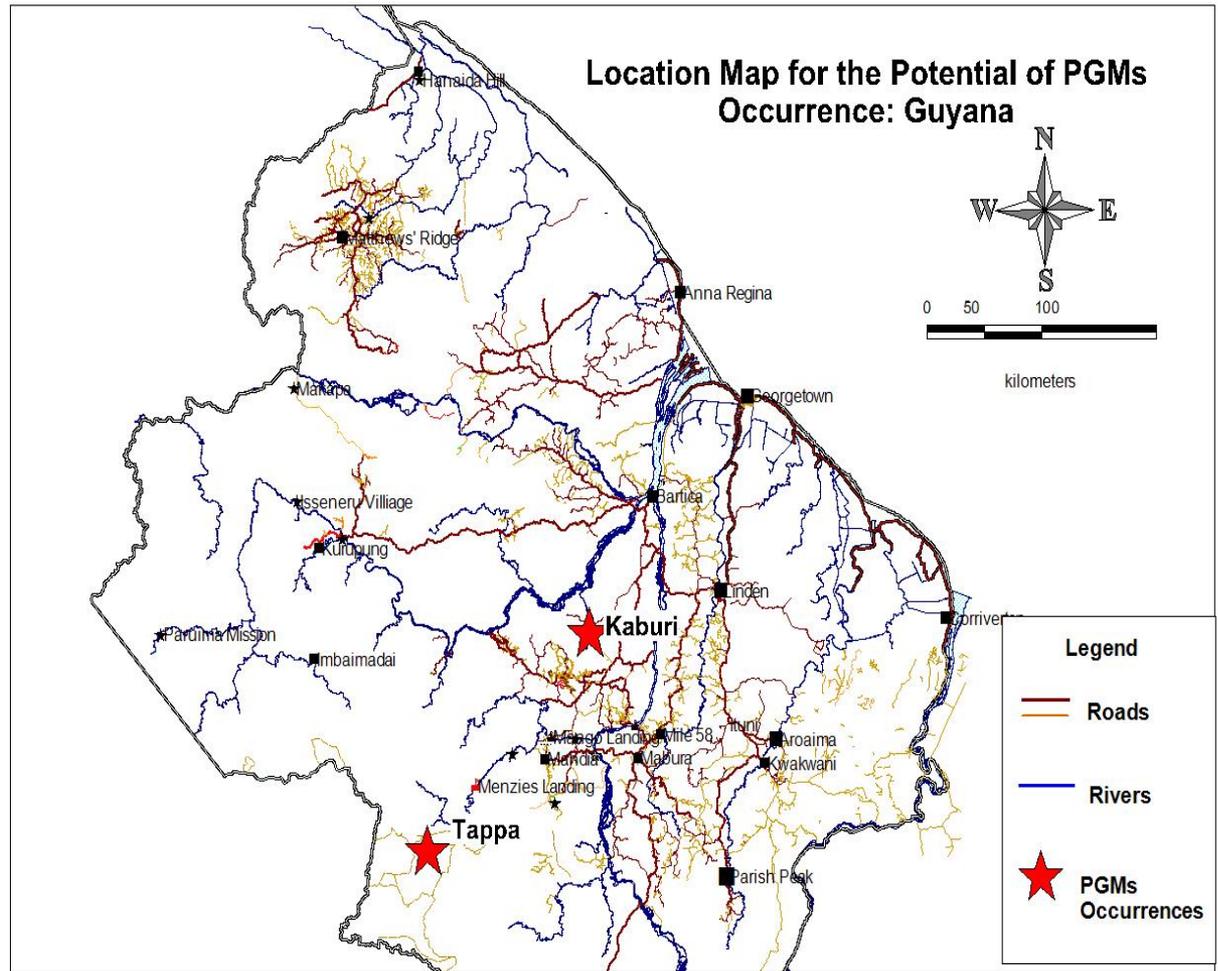
Bullions



Application in Electronic and Automotive



PGMs Occurrence in Guyana





Phosphate Facts and Formation

- ▶ There is a potential for Platinum Group Metals in two area namely Kaburi and Tappa
 - The Kaburi Anorthosite
 - Tappa Gabbroic Rock
 - (Potarites were found in Potaro River)



Phosphate– Uses

- Use of Polyphosphates for their diverse functionality in water based paints and coatings.
- Phosphates Used in the Processing of Various Ceramics.)
- Phosphoric acid–based chemical polishes are used primarily to chemically polish (brighten) aluminum and aluminum alloys.
- Many phosphorus–containing materials are used as flame–retardants for textiles, plastics, coatings, paper, sealants and mastics.)
- "Phosphates and phosphoric acid have many uses in the treatment of potable (drinking) water.
- Cleaning solutions with phosphates help clean mildew and stubborn stains on vinyl siding.



Phosphate – Uses



Malaria Tablets



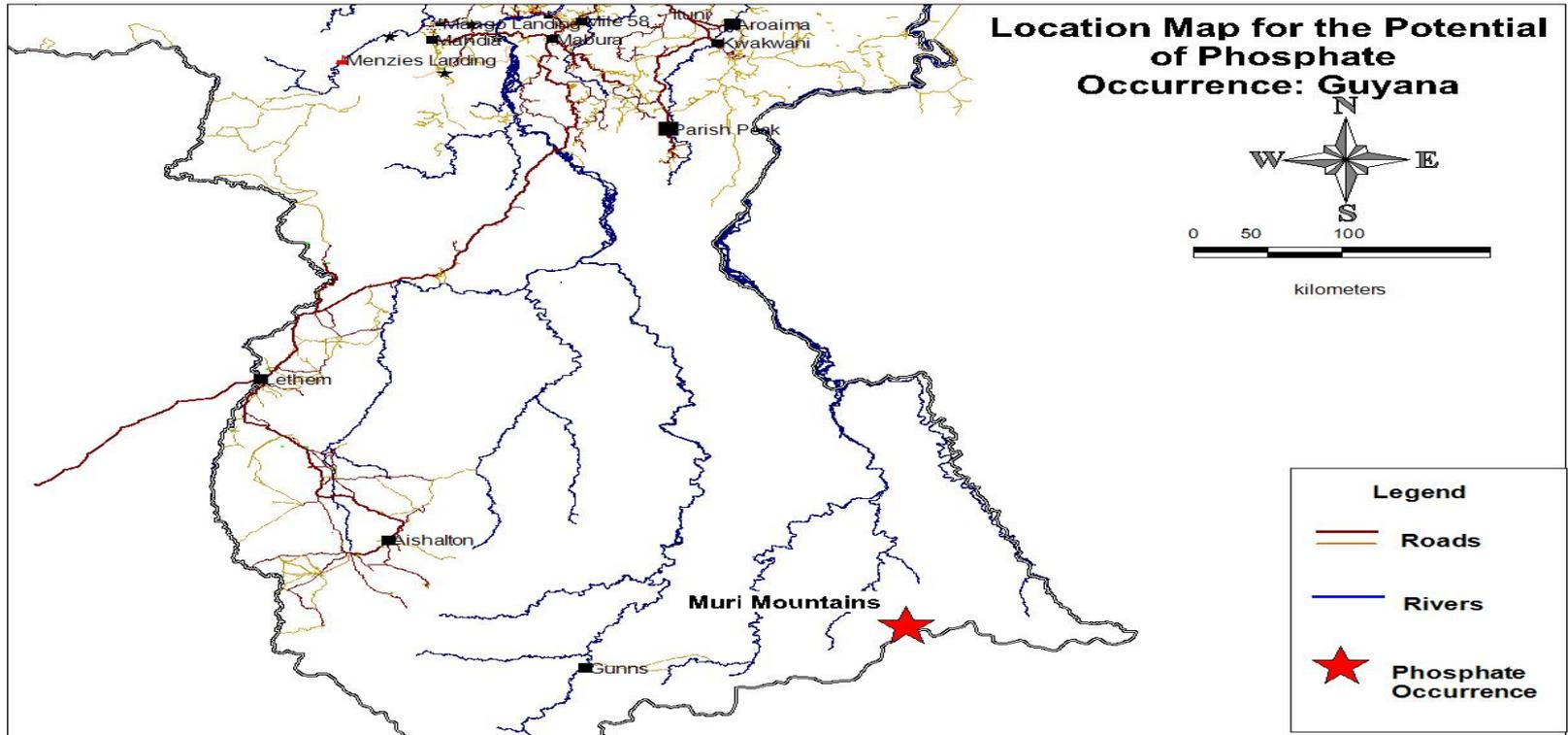
Fire Extinguishers



Dishwasher



Phosphate Occurrence in Guyana





CONCLUSIONS

- ▶ Guyana has a long history of mining
- ▶ Right geological environment for discovering large new deposits
- ▶ Has the potential for other minerals largely unexplored by modern methods
- ▶ Security of Title and Property Rights with 100% Foreign Ownership of PL's & ML's
- ▶ Rights to assign and transfer ownership of PL's and ML's
- ▶ Digital Geological and Cartographic data easily available for most mining areas
- ▶ Stability of agreement with mining companies
- ▶ Pro-mining Government
- ▶ Straight forward procedures for Application and licensing
- ▶ Mineral tenures are available to ALL Guyanese



THANK YOU