

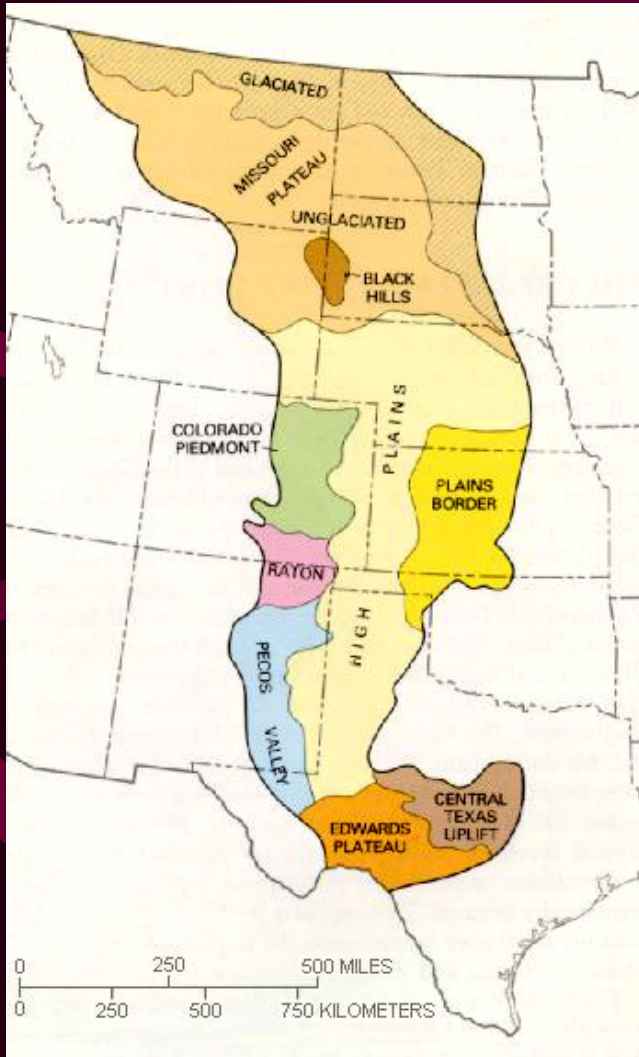
# **THE HOMESTAKE CORE ARCHIVE**

**Prepared for the South Dakota Science and Technology Authority by**

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**dba Scientific Endeavors**

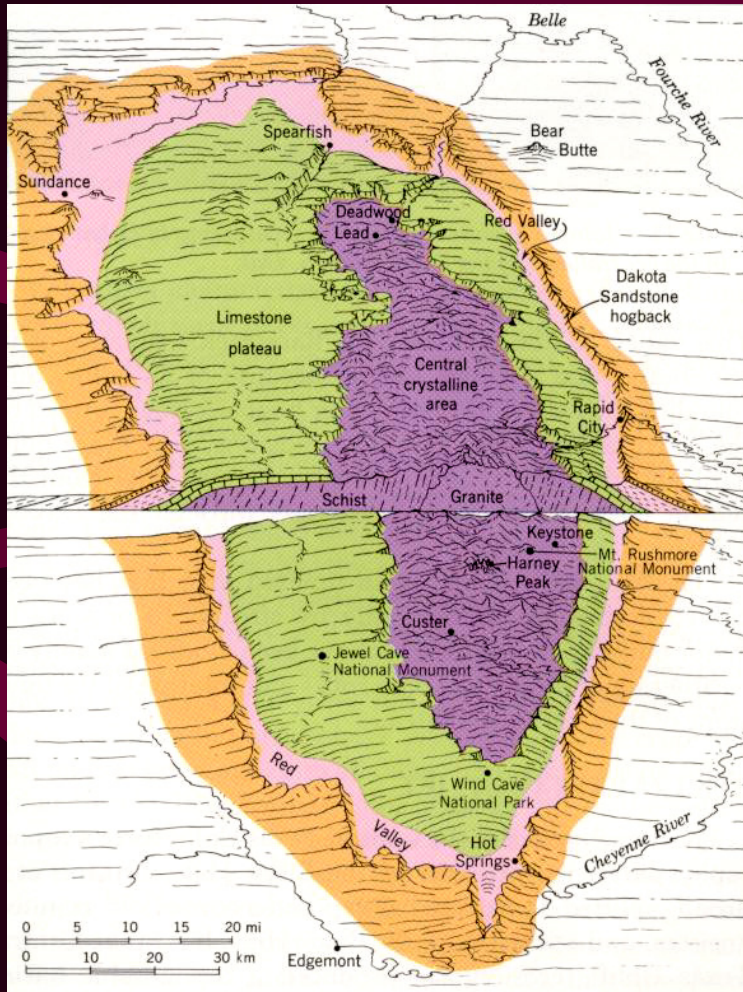
# BLACK HILLS GEOLOGY



From Trimble (1980)

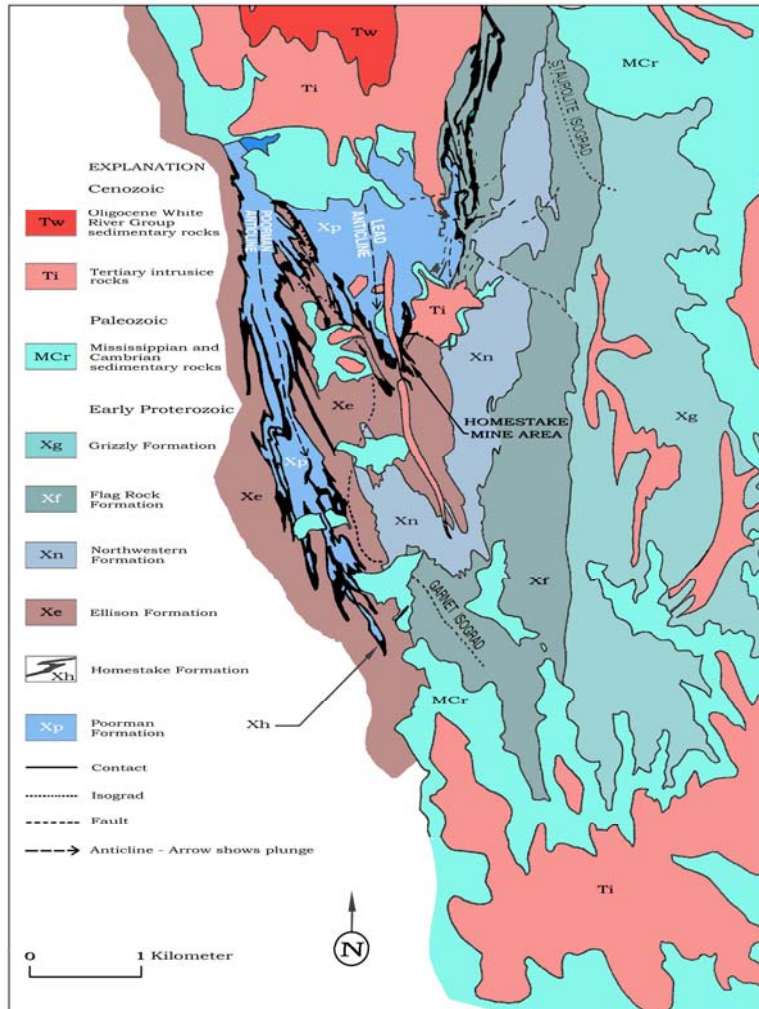
- An elongate domal uplift 100 km long and 60 km wide isolated in the Upper Great Plains.
- Uplifted during the Laramide Orogeny about 60-65 m.y. ago.
- Core of Precambrian phyllite, schist, and granite flanked by Phanerozoic sedimentary rocks.

# PRECAMBRIAN ROCKS OF THE BLACK HILLS



- Westernmost extension of the Rocky Mountain Uplift
- Precambrian rocks range in age from Archean to Early Proterozoic (>2.5 to 1.7 b.y.).
- Proterozoic and minor Archean rocks include schist, phyllite, granite, iron-formation, and metavolcanics.

# THE LEAD WINDOW



- Complex package of rocks comprising a unique package of rocks ranging in age from Early Proterozoic to Tertiary.
- Metamorphic and sedimentary rocks with local igneous intrusions.



# THE HOMESTAKE MINE

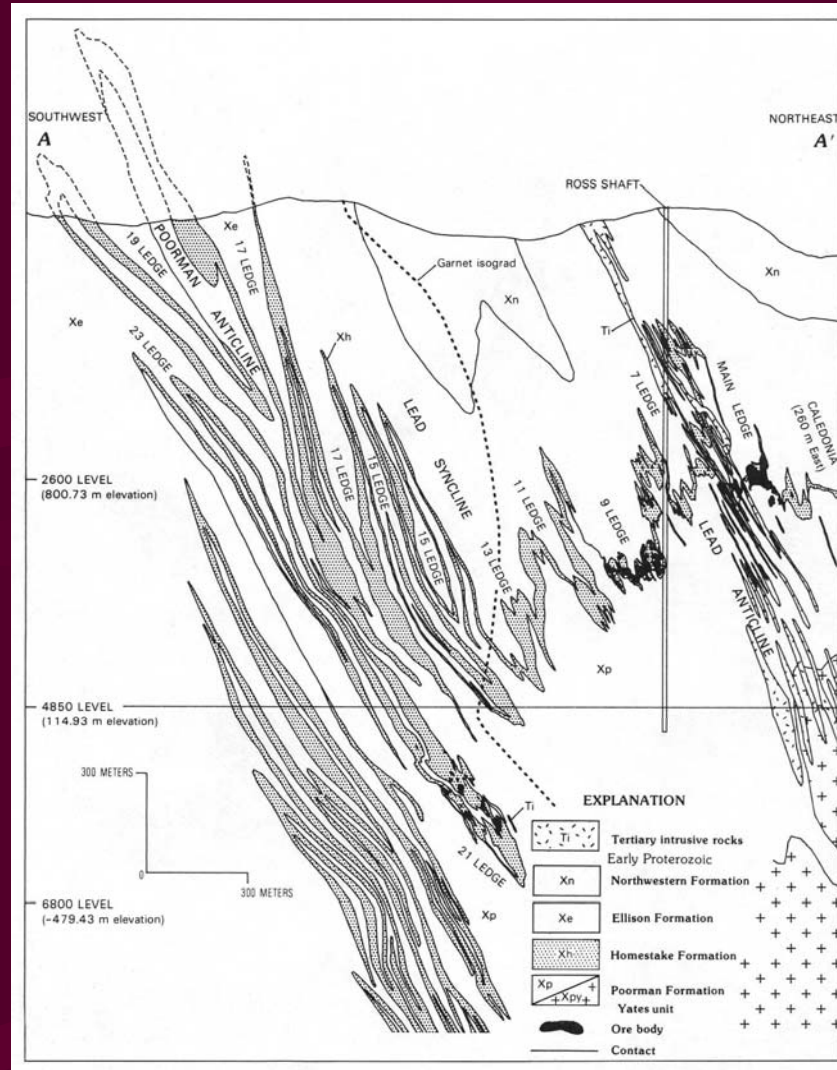


**World-class gold deposit and deepest mine in the Western Hemisphere.**

# GENERAL GEOLOGY

- Rocks are approximately 2 billion years old.
- Metamorphic rocks consist of metamorphosed and deformed equivalents of dirty sandstone, shale, iron formation, and mafic volcanics.
- Metamorphic grade ranges from middle greenschist to lower amphibolite (wide ranging pressure-temperature conditions).
- Complexly deformed geologic terrain.
- Interesting hydrologic environment.

# HOMESTAKE MINE CROSS-SECTION



View looking northwest

# THE HOMESTAKE MINE: A CLASSIC GOLD DEPOSIT

- Prototype for Precambrian iron-formation hosted gold deposits.
- Produced 40 million ounces of Au.
- Average grade of about 0.27 opt Au.
- Extensive infrastructure.
- History spanning one and a quarter centuries.
- Mine provides in-situ study of a significant block of the Earth's Paleoproterozoic crust 2.7 x 3 x 5 kms and 6.5 kms of plunge length with >500 km of drift.



# DIAMOND CORE DRILLING



- Represents the best sample obtainable for geologic, structural, and engineering purposes.
- Over 25,000 holes drilled in the mine and many holes drilled from the surface in the vicinity.



# INFORMATION OBTAINABLE FROM CORE

- Mineralogy and rock type.
- Large-scale structural information, fracture type and fracture density.
- Physical properties and critical rock mechanics data for underground engineering purposes.
- Determine distribution of rock types based on sprays of drill holes
- Geochemistry and lithologic pressure-temperature conditions.

# HOMESTAKE CORE REPOSITORY



- Currently comprises 750,000 feet of core and will be compressed to 500,000 feet for storage and curation purposes.
- Presently developing a database and long-term plan for storage, curation, and use to support scientific and engineering community.
- Available for immediate integration with DUSEL.

# REPOSITORY CONTENTS

- Nearly 500 miles of core drilled within the Homestake Mine and Northern Black Hills.
- Consists of underground cores drilled by the HMC production staff from the 1930's to the late 1990's.
- Both surface and underground cores drilled by the HMC exploration group and other companies in the 1980's and 1990's.
- Represents core extending from the surface to the 12,000+ equivalent level within the Homestake Mine.



# SIGNIFICANCE

- Largest single core repository in the world.
- Irreplaceable physical representation of a huge block of Early Proterozoic Earth's crust from a world-class gold deposit.
- Represents 60 million dollars in original drilling costs to acquire the core.
- Cores comprise a heterogeneous package of rock types that represent a variety of temperature-pressure conditions in the Earth's crust.
- Critical for engineering design and development of large underground excavations related to any proposed multidiscipline scientific experiments. Indispensable for geoscientists.
- Provide for continued geoscience research, educational and display material.
- Can be integrated with Homestake Mine digital and paper archive.

# CURRENT ACTIVITIES AND FUTURE ROLE

- Currently aiding research of seven Earth scientists from a variety of institutions nationally and internationally.
- Continuing progress on the archive inventory and database, plans for use, protocols, and equipment.
- Facilitate integration of repository with Homestake DUSEL.
- Contemplating the integration of the repository as a support entity for drill programs related to any proposed physics or Earth science experiments.
- Active core logging and storage facility with refrigeration capabilities.