PROPOSED NORTH AMERICAN GEOLOGIC-MAP DATA MODEL

SCIENCE LANGUAGE TECHNICAL TEAM

Examples of Geologic-map Database Queries

13 December, 2001

This document archives hypothetical geologic-map database queries developed by members of the Science Language Technical Team (SLTT) as of 30 November, 2001. The queries were developed in order to gain a feeling for the kinds of science concepts and science language that are resident in geologic-map databases and that might be queried by users of digital geologic-map information. The queries are archived just as they were submitted, with no modification (except for syntax).

This document should be cited as:
North American Geologic-Map Data Model Science Language Technical Team, 2004, Report on progress to develop a North American science-language standard for digital geologic-map databases; Examples of geologic-map database queries, Version 1.0 (12/13/2001), *in* Soller, D.R., ed., Digital Mapping Techniques '04—Workshop Proceedings: U.S. Geological Survey Open-File Report 2004-1451, 595 p. Queries accessed at http://pubs.usgs.gov/of/2004/1451/sltt/queries/.

[This report was formerly available at the North American Geologic Map Data Model Steering Committee website as http://nadm-geo.org/sltt/products/sltt_20_queries_master.pdf.]

List of Contributors		
Lee Allison Kansas Geological Survey	Joe Gregson U.S. National Park Service	Andrew Rorick U.S. Forest Service
Ernie Anderson U.S. Geological Survey	Thomas D. Hoisch Northern Arizona University	Paul Santi University of Missouri, Rolla
Brian Berdusco Ontario Geological Survey	Wright Horton U.S. Geological Survey	William Shilts Illinois State Geological Survey
Thomas Berg Ohio Geological Survey	Dave Houseknecht U.S. Geological Survey	David Soller U.S. Geological Survey
Sam Boggs University of Oregon	Bruce Johnson U.S. Geological Survey	Roy Sonenshein U.S. Geological Survey
Mark Bultman U.S. Geological Survey	Robert Jordan Delaware Geological Survey	Bill Steinkampf U.S. Geological Survey
William Cannon U.S. Geological Survey	Ron Kistler U.S. Geological Survey	Douglas Stoeser U.S. Geological Survey
Bob Christiansen U.S. Geological Survey	Alison Klingbyle Geological Survey of Canada	John Sutter U.S. Geological Survey
Jane Ciener U.S. Geological Survey	Dennis Kolata Illinois State Geological Survey	Robert J. Tracy Virginia Polytechnic Institute and State University
Jim Cole U.S. Geological Survey	Elizabeth Koozmin U.S. Geological Survey	David Wagner California Division of Mines and Geology
Stephen Colman-Sadd Geological Survey of Newfoundland and Labrador	Hannan LaGarry Natural Resources Conservation Service	Richard Waitt U.S. Geological Survey
Tim Connors U.S. National Park Service	Diane Lane U.S. Geological Survey	Peter Warwick U.S. Geological Survey
Peter Davenport Geological Survey of Canada	Vicki Langenheim U.S. Geological Survey	Richard Watson U.S. Bureau of Land Management
Ron DiLabio Geological Survey of Canada	Reed Lewis Idaho Geological Survey	Jerry Weisenfluh Kentucky Geological Survey
Lucy Edwards U.S. Geological Survey	Steve Ludington U.S. Geological Survey	Carl Wentworth U.S. Geological Survey
Stephen Eittreim U.S. Geological Survey	Jon Matti U.S. Geological Survey	Michael L. Williams University of Massachusetts
Robert Fakundiny New York State Geological Survey	Jim McDonald Ohio Geological Survey	Van Williams U.S. Geological Survey
Kathleen Farrell North Carolina Geological Survey	Dave Miller U.S. Geological Survey	Ric Wilson U.S. Geological Survey
Claudia Faunt U.S. Geological Survey	Douglas M. Morton U.S. Geological Survey	Robert Wintsch Indiana University
Charles Gardner North Carolina Geological Survey	Carolyn Olson Natural Resources Conservation Service	Mike Zientek U.S. Geological Survey
Mimi R. Garstang Missouri Department of Natural Resources	Steve Richard Arizona Geological Survey	

EXAMPLES OF GEOLOGIC-MAP DATABASE QUERIES

display units where basic igneous rocks dominate

display units with ultrabasic rocks as a component

display alluvial deposits more than 10 meters thick

display units with shear zones

display units with shear zones and silicic plutonic rocks

display units with sedimentary rocks that dip more than 25 degrees

display units with high-calcium limestone

display units with joints or fractures with less than 2-meter spacing

display units with less than 2 meters of unconsolidated surficial material

display units with more than 5 meters of unconsolidated surficial material

display units underlain by Tyee Sandstone

display units where the Tyee Sandstone is dipping west

display Holocene landslide deposits

display Holocene lahars

display Holocene eolian silt deposits

display Holocene bog or peat deposits

display inner-gorges (geomorphology)

display units with Mesozoic sedimentary rocks at the surface

display units underlain by the Tertiary White River Group

display units with high acid-rock-drainage potential

Display all polygons containing rocks with acid neutralizing capacity, even if a minor lithology in the unit.

Display all Early Proterozoic bimodal volcanic rocks deposited in a backarc basin environment.

Display all Precambrian rocks

Display all Proterozoic rocks

Display all Early Proterozoic rocks

Display all rocks of the Marquette Range Supergroup

Display all rocks of the Baraga Group.

Display all rocks of the Michigamme Formation.

Display all volcanic rocks of the Michigamme Formation

Display all mafic volcanic rocks of the Michigamme Formation.

Display all volcanic rocks of Michigamme Formation that were deposited during continental breakup.

Display all Early Proterozoic volcanic rocks and locate the massive sulfide deposits in them.

Display the thrust faults of the Penokean orogen.

Display the thrust faults of the Penokean orogeny that were reactivated during the Mid-continent rift.

Display the location of outwash deposits of the Chippewa lobe.

Find all units composed of clayey lodgement till.

Find all sandy glacial deposits.

Where is the terminal moraine of the Miller Creek Formation

Display the ice flow directions within the Green Bay lobe.

Show where there is less than 50 feet of glacial deposits on Middle Proterozoic mafic intrusive rocks.

show all bedrock geologic units

show all surficial geologic units

show slope-failure deposits that consist of earthflows

show slope-failure deposits that consist of slump blocks

show all slope-failure deposits of late Holocene age, irrespective of origin

show all geologic-map units that have middle Devonian limestone deposited in platform-margin environments

show Cretaceous sandstone-mudrock sequences deposited in foreland high-sinuosity river plains

show all marine mudrock deposits that accumulated in oxygen-deficient environments

show all basaltic units, irrespective of their specific petrologic classification based on modal analysis

show polygons of nonmarine sedimentary deposits where pebbly conglomeratic sandstone constitutes more than 50% of the map unit

show polygons in which the XYZ shale dips northwestward greater than 25 degrees on slopes steeper than 10 degrees

show all orthogneisses that have mylonitic fabrics and are intruded by alkalic plutonic and hypabyssal rocks of Triassic age

show all gneissose rock, whether metamorphic or plutonic in origin

show low-angle faults that are extensional in origin

show polygons of unit XYZ where sedimentary bedding is overturned beneath thrust faults of mid-Tertiary age

show surficial deposits having fractures that are partly closed by caliche

show surficial deposits that have clast populations dominated by carbonate rock, whether dolostone or limestone

show surficial deposits that have well-developed surface armor

show Tertiary nonmarine deposits of lacustrine origin that have gypsum or anhydrite greater than 5% by volume

show all hanging-wall rock units where Mesozoic 2-mica granites intrude metacarbonate rock

show all sand-and-gravel units that have greater than 7% silt

show all Cretaceous sandstone deposits that have information about primary porosities

show all polygons of unit X where the map-unit identification was made on the basis of outcrop identification

show all polygons of unit X where the map-unit identification was made on the basis of extrapolation, and tell me the basis for the identification (binoculars, aerial photos, TM imagery, etc.)

show all polygons of unit X where the map-unit identification is based on compiled sources, and identify the source

show all polygons of unit X where the map-unit identification is little more than a guess

show surficial deposits having average standard-penetration values less than N=20

show surficial deposits younger than 250,000 years that are cut by thrust faults

show all Tertiary deposits, marine or nonmarine, that consist mainly of sandstone, and re-select for those deposits dominated by well-sorted, clean sandstone

show marine deposits that formed in strand-plain or barrier-bar environments

select Tertiary alluvial-fan deposits dominated by debris-flow depositional processes

select pull-apart basin deposits that accumulated within the San Andreas transform-fault system

Display surficial deposits having open fractures striking between 045 degrees and 090 degrees, with fracture spacing denser than 1 fracture per meter

Display all intrusive contacts of late Cretaceous age

Display all landslide contacts

Display all depositional contacts that overlie angular unconformities

Display all polygons where smectite-bearing mudrock dips steeper than 15 degrees

select Tertiary nonmarine deposits where the mudrock:grainrock ratio is greater than 2:1

show volcanic deposits that are highly weathered and easily excavatable

show all granitoid rocks that are stained brownish-red, whether or not the stain is understood in terms of its mineralogy or its geochemistry

Where can I find nonmarine Cretaceous rocks in South Carolina? Or shallow marine, etc.?

If I specify groupings (e.g., sand + moldic limestone + gravel vs. clay + siltstone), will you draw a map of my groupings?

What is under my house (or vacation property)? E.g., Rock type? Faults? Anything susceptible to landslides?

How deep do I have to drill my well?

Display all occurrences of unit Tvb.

Display all occurrences of Quaternary units.

Display names of all Eocene units.

Display all deep-seated landslides within a separately specified perimeter, such as a city boundary.

Display all hard rocks with close fracture spacing.

Display all turbidite units exhibiting groove casts.

Display all units containing arkosic wackes.

Display all units with sandstone containing more than trace amounts of glauconite.

Display surficial deposits with a shear-wave velocity less than 200 meters per second.

Display kinds of planar point features.

Display upright bedding attitudes with dips greater than 45 degrees

Display stations at which multiple structural orientations are recorded.

Display foliation within non-metamorphic units.

Display fossil localities that conflict with age assignments of units.

Display contacts separating non-intrusive bedrock units that are not in stratigraphic order.

Display all unconformable contacts.

Display maximum areal limits within which the surface trace of a specified fault could lie.

Display 90% confidence limits on the location of a specified fault.

Display bedrock geology after stripping off Quaternary cover.

Display where I should not buy a house.

Display all rock units denser than 2.67 g/cc;

Display outcrops that correspond to magnetic anomalies with amplitudes of 100 nT and greater;

Display outcrops of turbidites that correspond to magnetic anomalies with amplitudes of 100 nT and greater;

Display all faults that dip 60 degrees or greater;

Display all listric faults;

Display all intrusive rocks that are ilmenite-bearing;

Display locations of geochemical analyses of intrusive rocks that are ilmenite-bearing;

Display all intrusive units that are inferred to be ilmenite-bearing;

Display thrust faults that are reactivated Miocene normal faults;

Display the unconformity separating Jurassic/Cretaceous from the Miocene units;

Display where well data indicate alluvial thicknesses of 500 ft and greater;

Display all inferred faults within Quaternary alluvium based on analysis of water levels

Display right-lateral strike-slip faults having 1 km or greater offset;

Display right-lateral strike-slip faults having unknown amount of offset;

Display all cataclastic rocks;

Display all reversely-magnetized basalt flows that are younger than 10 Ma;

Display all intrusive contacts with evidence of shearing and/or cataclasis;

Display all faults with evidence of movement during the Holocene;

Display all faults that coincide with alignments of seismicity

Display all Paleozoic sedimentary units that are predominantly composed of dolomite

Display all blind thrust faults that will produce a magnitude 6 or greater earthquake in the next 30 years

Display the rock units in the map set, generalized at stratigraphic Group level or equivalent

Display the distribution of formation x, including all its members

Display the distribution of Paleozoic and older rocks

Display the felsic intrusive rocks younger that 65 Ma

Display the distribution of Formation Y and all its stratigraphic equivalents

Display the distribution of glauconite-bearing rocks

Display the distribution of eskers greater that 2 km in length

Display all the areas of lodgement till, both at surface and below other surficial cover

Display all the rock units that include the Oxfordian Stage

Display all the intrusive contacts

Display all catastrophic flood deposits;

Display all Cambrian units that contain limestone;

Display all units that contain fine-grained quartzite;

Display all the rhyolite dikes;

Display all hornblende-bearing plutonic rocks;

Display all occurrences of the Hayden Lake stock;

Display all porphyritic plutonic rocks;

Display all basalt that has pillows;

Display all deposits related to glacial activity;

Display all intrusive rocks that are foliated;

Display all subvolcanic intrusive rocks;

Display all flood basalt;

Display all lacustrine deposits;

Display all syenitic rocks;

Display all andesitic and basaltic volcanic rocks;

Display all units that contain arkose;

Display all unconsolidated deposits that contain sand;

Display all terraces;

Display all granitic rocks that have more K2O than Na2O;

Display all units with radiometric age data;

Where are there carbonate rocks metamorphosed to amphibolite facies

Where are there contacts between Laramide plutons and Mississippian

Limestone

Where are faults younger than 28 Ma

Where are Devonian rocks

Where are granites

Where are white rocks

Where are mines in Miocene silicic volcanic rocks

Where are gold mines in Jurassic rocks

Is this site within 50 km of a Quaternary fault

Where does coarse sandstone underlie basalt lava flows of Miocene age

What map units contain gravel in their upper part.

What rock bodies (map units) overlie a particular angular unconformity.

What rock in a particular region contains the most biotite

Where are there rocks metamorphosed to at least greenschist facies between 125 and 140 Ma.

What rocks in a give area are similar to a particular rock

How many different rock types are present in a given area

Who mapped this contact

What is the definition of this map unit

What kind of fault rocks occur along this fault

Exactly how is the contact between the Escabrosa Limestone and Horquilla Limestone defined on this map

Where does the Cambrian sections contain more than 50% carbonate rock

Where is fracture density of surface rocks great enough to significantly enhance hydraulic conductivity?

In what surficial materials is silt>5% and eolian sand<5%?

What is the transport direction of eolian sand?

What faults were active during the middle Pleistocene?

How much field investigation was focused in this particular fault intersection?

Which faults may perturb shallow groundwater flow enough to enhance vegetation? To form springs?

What surficial materials have weak Av horizons?

In what areas will I likely find a debris-flow deposit within 2 m of the surface?

What is the percent gravel in all surficial materials, incremented by 10%, between 25% and 75%?

In what units are chert and shale combined?

Where are limestone units adjacent to plutons?

How does the result of Q #11 compare to locations of skarn deposits?

What playa deposits lie within 50 km of Cenozoic epithermal gold systems?

What orientations are caves likely to have in carbonate deposits of XYZ mountains?

Where are biota dependent on serpentine soils likely to and with what probability?

Where should I target surface materials for federal highway-grade concrete aggregate?

What potential rip-rap sources lie within 20 km of a railroad?

Where are soils likely to exhibit shrink-swell?

Where will I likely encounter caliche within 1.5 m of the surface? 6 m?

Which questions should be asked of all geologic map databases and which are specific to individual databases?

From what sources was this map element compiled?

show all units containing sulfide mineralization.

show all units containing Ordovician fossil localities.

show parts of the map compiled from the original mapping of Smith (1946).

generalize the map so that it is shows undivided Supergroups or Groups, but break out as a separate unit the felsic volcanic breccia in the Bimodal Member of the Volcano Formation of the Volcandseds Group.

show all units of black shale whose known or suspected age coincides with some part of the Nemagraptus gracilis graptolite zone.

show all the bedding measurements for which tops are known.

show all foliation and lineation measurements that were measured together as pairs on a single foliation surface.

show all the polygons of the Right Formation and the Wrong Formation, where the two formations are in stratigraphic contact with each other.

show all strike-slip faults that have known sinistral movement between 450 and 423 Ma.

show all occurrences of coexisting kyanite and sillimanite.

show the locations of all samples dated by the U/Pb method using the mineral titanite and returning an age between 1345 and 1326 Ma.

show U/Pb age determinations performed at the Royal Ontario Museum geochronology lab.

show all occurrences of the trilobite, Paradoxides davidis.

show all faunal assemblages of Celtic faunal provinciality.

show all hypersolvus granites.

show the allochthonous rocks in the area.

show bedrock units where nickel in lake sediments is between 60 and 75 ppm.

show areas of plutonic intrusions, divided into mafic, felsic and intermediate.

show areas of the granulite facies metamorphic terrane that have been affected by greenschist facies retrogressive metamorphism.

show all occurrences of superimposed glacial striae.

What is the geologic description of this unit?

Show the type section of the ____ unit?

What stratigraphic units have been metamorphosed?

What is the geochemical signature of this unit?

How can I geochemically differentiate these two terranes?

Where is the best place to find fossils that I can get to?

Where are fossil locations (or radiometric ages) in "this" unit (and only this unit)?

How was the age of this unit determined?

Who did the ages on the ____ pluton and are they any good?

How extensive is the hydrothermal alteration near ____?

Where are the oldest glacial deposits?

Were there Pleistocene lakes in the area and where? Through which route did they drain?

I define the "Wasted" terrane as having these characteristics, show me where these criteria are met in this map area.

Who put these lines on the map? Are they reliable and at what scale?

What is the reliability and or data density in various parts of the map area?

How interpretive is this map, relative to "ground truth"?

Is there redundancy in the data and why?

What is the statistical error in the data and how is it calculated?

At what scale is the data valid?

What is the useable scale range of the data?

Is the data sufficient to provide a user geographic reference to locate themselves?

Display all faults of regional extent that have gold occurrences

reasonably close and show the occurrences.

Which faults have known or suspected Holocene and Pleistocene movement?

What areas are likely to have poor conditions for building?

Is radon gas a problem in this area?

Permafrost is a problem here, how do I know where the safest place to put my pipeline would be?

I'm a recreational gold panner, where can I go and be successful (and legal)?

Display all limestone and marble units, as well as mapped sinkholes.

Display all units and subdivisions of one or more named stratigraphic units (such as the Newark Supergroup, Great Smoky Group, or Ashe Metamorphic Suite).

Display all charnockites and granulite-facies metamorphic rocks.

Display all Mesoproterozoic rocks (or rocks having any given age range such as Triassic and Jurassic, Cretaceous and younger, or Quaternary).

Display all Paleozoic intrusive rocks grouped according to age, as well as symbols distinguishing magmatic flow foliation and regional foliations.

Display all units assigned to a given regional geologic "province," "belt," "zone," or "terrane" (such as Atlantic Coastal Plain Province, Kiokee belts, Carolina terrane, Avalon zone), adding symbols for mineral elongation and stretching lineations.

Display all Mesozoic igneous rocks (or all members of a similar broad age/rock class such as all Mesoproterozoic metasedimentary rocks).

Display all Cretaceous and Cenozoic faults, classified according to relative movement (low-angle thrust, steep normal or reverse, sinistral or dextral strike-slip, etc.).

Display all faults, shear zones, and rock units characterized by mylonitic fabrics.

Display all rock units in and adjacent to the Brevard and Mountain Run fault zones (or other named fault zones), or all faults of the Stafford fault system (or other named fault system).

Display all Paleozoic thrust faults (or other faults of specified age and type).

Display all normal and reverse faults in contact with stratified units of Triassic or Jurassic age; or all faults that offset Cretaceous and younger units.

Display separate "bedrock" and "surficial" geologic maps, plus a "complete" (combined bedrock + surficial) geologic map.

Display a "lithologic map" by applying a standard or customized lithologic classification.

Generate a "lithogeochemical map" (showing general lithologic and hydrogeochemical characteristics) by applying a standard or customized reclassification of rock units as in http://water.usgs.gov/pubs/wri/wri994000

Generate a "surface materials map," reclassifying surficial deposits (glacial, fluvial, etc.) and bedrock units where surficial deposits are thin or absent, according to material properties (as recently done for Connecticut).

Generate a "generalized geologic map" applying a standard or customized grouping of units.

Display all granites and granodiorites of Mississippian, Pennsylvanian, and Permian age, showing sample locations and references for U-Pb zircon dates by ion microprobe (from national geochronological database).

Display all geologic units known to contain past or present sources of crushed stone (from mineral resource database) plus other units having similar characteristics.

Display all greenschist-facies mafic volcanic rocks known to contain abandoned copper mines (from mineral resource database).

Display all granitic units that contain traces of molybdenite or molybdenite prospects (from mineral resource database).

Show shale that lies stratigraphically above Pennsylvanian limestone

Show evaporite deposits adjacent to modern rivers or lakes

Show phosphate deposits located upstream from cities greater than 50,000 population.

Show limestone units in areas that receive more than 20 inches annual precip.

Show granites that contain more than 50 ppm whole-rock uranium

Show unconsolidated sand and gravel deposits that overlie granitic rock

Show unconsolidated sand and gravel deposits located within 20 miles of cities greater than 50,000

Show Neogene basalt units adjacent to rivers

Show locations of shale where bedding dips greater than 30 degrees in the downhill direction

Show thrust faults that overlie Mesozoic shale

Show Franciscan Formation where slope exceeds 20% and annual precipitation exceeds 25 inches

Show granitic intrusions into limestone

Show organic-rich peat deposits in areas other than permafrost locations

Show Neogene lacustrine deposits located east of the Sierra Nevada

Show Late Pliocene volcanic rocks (or sources), Late Pliocene lacustrine beds, and Late Pliocene terrace deposits

Show loess deposits that are greater than 2 m thick

Show units containing coal seams thicker than one meter located on tribal lands

Show reversely polarized early Pleistocene basalt

Show reverse faults that cut Neogene deposits

Show areas underlain by shale where 30-m DEM data define a surface roughness value in excess of (some threshold value).

Display the location of all glacial bog deposits greater that 10 feet thick in Franklin County, Ohio.

Display the location of all sand deposits greater than 15 feet thick within 10 feet of the surface in Hamilton County, Ohio.

Display the distribution of all Upper Freeport coal greater than 36 inches thick in Noble County, Ohio.

Display the outcrop pattern of the Olentangy Shale in Delaware County, Ohio.

Display the distribution and thickness of colluvium derived from Pennsylvanian red claystones in Athens County, Ohio.

Display the bedrock topography of Williams County, Ohio.

Display the distribution of unconsolidated, high-level Pliocene sediments flanking the Scioto River Valley from Columbus to Portsmouth in Ohio.

Display the distribution of Quaternary alluvium greater than 20 feet thick in Adams County, Ohio.

Display the distribution of the Kope Formation in Butler and Hamilton Counties, Ohio.

Display the distribution of the Black Hand Sandstone in Hocking County, Ohio.

Display the location of all Pleistocene lacustrine deposits in Muskingum County, Ohio.

Display the location of all abandoned underground coal mines beneath the Interstate Route 70 corridor from Newark to St. Clairsville in Ohio.

Display the location of all probable karst areas of western Ohio.

Display the location of all buried valleys in Shelby County that are filled with Pleistocene sand and gravel.

Display the location of all gravel deposits greater than 15 feet thick that are more that 100 feet from the high water mark of the Great Miami River in Ohio.

Display the location and orientation of all mapped bedrock fractures in Summit County, Ohio.

Display the location of all Columbus Limestone in Ohio that has 25 feet or less of glacial cover.

Display the location of all abandoned Berea Sandstone quarries in Cuyahoga County, Ohio.

Display the location of all till bluffs over 15 feet high along the Lake Erie coastline.

Display the location of all economic crushed-sandstone aggregate resources in Wayne National Forest in Ohio.

Display all polygons mapped as open water.

Display all polygons mapped as (each map unit symbol in turn).

Display all map units that are mapped as lines only (for example, dikes).

Display all map units that are mapped as both lines and polygons.

Display (named fault or fold).

Display map units in the area of (name of geographic feature).

Display map units in the (northeast or other area of the map).

(Obviously the last kinds of queries would require additional attributing of map units over and above what is commonly done.)

Display all areas of altered rock.

Display all areas of fault breccia.

Display all faults (or folds) of nth generation.

Display all attitude symbols of nth generation.

Display all (upright, overturned) (synclines, anticlines).

Display all (certain, approximate, inferred, concealed, or gradational) contacts.

Display all (certain, approximate, inferred, or concealed) (folds, faults).

Display all (sample localities, mines, etc.).

Display all (certain, approximate, or concealed) (caldera boundaries, landslide scarps, etc.).

Display all formations in the _____ Group.

Display all members in the _____ Formation.

Display all map units that consist of two or more units mapped undivided.

Display all (Quaternary, Pleistocene, Archean, etc.) map units.

Display all the fault scarps buried by < 3m of material.

Display all the debris flows with north aspects.

Display the thickness of alluvium in the Red River reach from point A to point B (assuming these points could be digitally located).

Display all the locations where caliche (indurated carbonate or calcrete -here's an example of needing a common term) is within 3 m of the surface.

Display all faults having a NW-SE trend.

Display all gravel deposits larger than 0.5 ha.

Display a cross section along the line A-A'.

Display the locations of all sites with mineralogic data in section 8, T12N, R3E.

Display the location of all terraces > 3m above the flood plain

Display which stratigraphic units have analytical data

Display all the areas whose patterns resemble dunes along major east-west rivers of the High Plains

Display all the sinkholes in section 12 and calculate the mean, median and mode of their diameters

Display all the playas in Hale Co., Texas and fit them to a drainage pattern.

Display all the landslides in Clearwater Co., Idaho and separate by originating parent rock type.

Display the Wisconsin moraines in Iowa and fit to a soil moisture map of Iowa.

Display all the abandoned surface mining sites in Pike Co., Kentucky.

Display all mine tailings within 3 m of a stream

Display all drainage patterns and fit to regional lineaments (or regional structural trends)

Display all locations where the water table is within 20m

Display all soils (and/or surficial sediments) with carbon contents > 3% in the upper 10 cm.

Display all sedimentary rocks

Display all metamorphic rocks

Display all igneous rocks

Display all faults (by type)

Display all folds (by type)

Display all strike & dips and other geologic symbols

Display all sandstones, etc. (make a list of primary rock types)

Display all limestones, etc.

Display all coal beds

Display all oil &/or gas wells

Display all oil seeps

Display all mines

Display all intrusives/extrusives

Display all oil, gas or coal fields

Display all wetlands

Display all references

Display all rock types in a list

Display all outcrops

Display all areas with steep terrain

Display all bedrock vs. alluvium

Display all cross section index

Identify all polygons that contain sample points with TOC (total organic carbon) attribute values in excess of 1%.

Identify all polygons that contain sample points with apatite fission track cooling age values between X and Y Ma.

Identify all sample pairs for which the distance between samples is less than 1 km and for which paleontological analysis has yielded Oxfordian for one of the samples and Kimmeridgian for the other of the samples.

Identify all thrust faults whose strike is between 80 and 110 degrees and whose vergence is south.

Identify all formation polygons whose contact with immediately younger formation polygons defines a closed line segment.

Identify stream segments that cross polygons containing sample points with sulfur attribute values in excess of X%.

Create a 1 km buffer around strike/dip symbols characterized by dips greater than 45 degrees.

Identify pairs of strike/dip symbols for which the distance between symbols is less than 1 km and for which minimum difference in dip directions is at least 120 degrees.

Identify lines (including contacts and faults) that separate formation polygons that are not directly adjacent to one another in the map legend.

Identify stream segments that (a) cross formation polygons containing sample points with “oil-stained rock” attribute and (b) are within 0.5 km of topographic relief of at least 100 m.

What is the bulk mean density of map unit A? (bulk mean density could be replaced by any physical property).

Produce a file of all gravity measurements from map unit A in the given region. This file must contain x,y,z information as well as metadata.

Display contours of the Bouguer gravity anomaly map over this region of the geologic map.

Display all faults and contacts that separate bedrock from basin fill.

Remove all Cenozoic basin fill units, in their place display depth to basement (contours or color).

Remove all Cenozoic basin fill units, in their place display depth estimates and trends based on magnetic and/or gravity analysis.

Superimpose all mapped faults, including dip information, in region where Cenozoic basin fill geology has been removed.

Display all aeromagnetic survey flight lines over the geologic map of this region. Code line colors according to survey altitude and/or survey date (or ID).

Display aeromagnetic data of selected flight line centered on its flight line superimposed on the geologic map.

Display ground based magnetic survey location information. Display data projected to a straight line between selected endpoints. Calculate textural properties (fractal dimension) in the region overlain by map unit A.

Generate a map where wavelet (A) displays a correlation of 0.75 or greater with the magnetic anomaly map. Overlay mapped faults. Overlay mapped intrusives, dikes, and sills with a magnetic susceptibility greater than 0.005.

Display all cryptogamic soils in this region.

Display all surficial material with particle size distributions of more that 20% sand.

Display all locations where map unit A has an aspect of 135-270 degrees and a slope of 10-60 degrees.

Display all locations where the composition of surficial unit A (or all surficial units) is > 50% quartz.

Display all contacts and faults in white on top of this geophysical grid.

Find all water wells that are found at the surface in “sequence A” of basin fill material.

Find all water wells that may intersect “sequence A” at 100m depth” What is the spatial variation (semi-variance?) in particle size distribution, cementation, (and possibly) porosity, and permeability of basin fill unit A?

What is the volume of basin fill unit A in this region?

show all historically active faults

show all outcrops with measured sections and age dates

show geologic units older than Mississippian

show provenances of sand sources of the Arkansas River

show Quaternary units with active sand and gravel quarries

show sandstone outcrops with permeabilities over 1 md in aquifer recharge areas

show northeast-oriented fractures without calcite fill

show wells that penetrate to the Precambrian and the type of rock

show liquefiable soils within the 100-year flood plain

show the maximum extent of ejecta blankets associated with buried meteor impacts

show desert tortoise habitat and bedrock sand grain size

show forest fire severity and bedrock moisture content

show where the geothermal gradient exceeds 4.0 degrees C when it intersects Pennsylvanian shales

show roads that overlie units with greater than 5% gypsum that are within 150 feet of the surface

show channels on alluvial fans active in the last 12,000 years

show areas underlain by mined-out coal deposits greater than 4 feet in thickness

show all paleostress indicators within 20 degrees of east-west orientation

show overturned beds

show the maximum seaward extent of lower shoreface units in the Ferron sandstone

show trailer parks in karst deposits

What is the material investigated (rock type, mineral, liquid, gas)?

Where is the material from (lat. long.; range township, section, location map)? Is the age of the material known?

Were data generated in more than one laboratory (chemical lab, isotope lab, wet chemistry, dry chemistry, etc.)

What is the element(s) investigated?

What kind of isotope(s) is reported (radiogenic, stable)?

What techniques were used to determine elemental abundances?

What techniques were used to determine isotopic abundances or ratios?

Were initial isotopic ratios calculated for radiogenic isotopes?

How was age of material determined?

Are age determination available from different techniques and/or isotope systems?

Are ages by different techniques the same or different?

If different, is it known why (geologic factors, analytical factors)?

What are the precisions of the measurements?

What are the accuracy's of the measurements?

When were initial radiogenic isotope ratios calculated (decay constants and isotopic abundances used)?

Who and/or what are the sources of data (references, written communication, rumor, guess, plagiarized)?

Are there other chemical or isotopic data elsewhere for materials in database?

Where are additional data available (library, internet, internal memo, rumor, etc)

Why was the work done (is there a problem)?

Where can I find nonmarine Cretaceous rocks in South Carolina? Or shallow marine, etc.?

If I specify groupings (e.g., sand + moldic limestone + gravel vs. clay + siltstone), will you draw a map of my groupings?

What is under my house (or vacation property)? E.g., Rock type? Faults? Anything susceptible to landslides?

How deep do I have to drill my well?

Display where there is peat in Florida.

Display where there is peat in contact with Pleistocene limestone in Florida.

Display some outcrops of the Gosport Sand in Alabama.

Show me anywhere faults seem to have a circular pattern (or where clustered faults seem to have a lack of preferred orientation).

Display the gravel pits in southeastern Virginia and tell me the formation that is being mined.

Who has ever done geologic mapping in North Carolina?

Who has ever done paleontological studies in North Carolina?

Can you print out the paleontological data for specific sites used in making a map?

Where is the Ashley Formation of shallow marine origin?

What percent of the Ashley is shallow marine?

Can you draw a marine/nonmarine map for a particular time slice or series of time slices (or limestone/sandstone map, etc.)

Anything to help overcome edge effects/state line faults. (Display all the nonmarine sand of late Paleocene age in Georgia and South Carolina, and when you do, tell the various formation names.)

Expand queries such as the one above (Ok, now display early Eocene nonmarine sand, and any undated nonmarine sand, too).

Anything to help the user look for patterns in the data (do joints in one part of the map trend one way and in another part of the map trend a different way).

In maps where there is both surficial and bedrock coverage (or any maps where there is more than one coverage), anything to help look for similarities/differences that are related.

Where can I find gold?

Display all units for which a drainage line also acts as one of the unit's contacts.

Display all units for which faults act as unit boundaries.

Display all map units that change rank term (for example, from Formation to Member) within the map area.

Show me where the transition mentioned in #3 above occurs.

Display the type section locality for the Anakeesta Formation.

Display all conodont localities in the Conococheague Limestone..

Display all drill holes in the map area and link to their logs (so I can check a cross section).

Display all units that should have scratch boundaries shown for all or part of the unit.

Display all units that are described as stacked (for example, silt over sand over gravel).

Display all features related to the Acadian orogeny.

Display all contacts that are mapped as unconformities.

Display planar symbols that intersect with other planar symbols.

Display linear symbols that intersect with planar symbols.

Display the location of slope-movement scarps on southwest-facing, treeless slopes.

Display the location of slope-movement scarps in the Reedsville Shale with dips greater than 25 percent.

Display all residual soil developed on southeast-facing slopes.

Display all slope-movement scarps only on the soil found in #16 above.

Display all slope-movement scarps only in residual soil or colluvium developed over limestone.

Display all recent slope movements that occurred in areas mapped as ancient debris-fan deposits.

Display all slope movements in the Potomac River drainage basin.

Display all the landslide deposits.

Display all the marine clay

Display all the glacial striae and glacially streamlined landforms

Display all the glacial lake and raised marine shorelines

Display the map polygons that are till

Display all the eskers

Display all the organic terrane that is within the zone of discontinuous permafrost

Display the all-time glacial limit in northwestern North America

Display all areas of thick till

Display placer gold deposits

Display location of all known kimberlites

Display all sites with more than one set of glacial striae

Display all eolian deposits

Display all clay-rich till

Display all iceberg scours on the continental shelf and on the bed of Glacial Lake Agassiz

Display all end moraines and large recessional moraines.

Display all the calcareous till

Display all the aggregate deposits within 100 km of a deepwater port

Display all crosscutting relationships in streamlined glacial landforms

Display all the rock outcrops that are too small to show as polygons.

Display all glacial deposits

Display all till deposits

Display all outwash deposits

Display all drift deposits

Display all stream deposits

Display all fluvial deposits

Display all lacustrine deposits

Display all lake deposits

Display all flood deposits

Display all gravel deposits

Display all sand deposits

Display all clay deposits

Display all debris flow deposits

Display all moraine deposits

Display all levee deposits

Display all volcanic deposits

Display all pumice deposits

Display all pyroclastic flow deposits

Display all lava flow deposits

Display all lahar deposits

Display all dome deposits

Display all landslide deposits

Display all debris avalanche deposits

Display all tsunami deposits

Display all sedimentary units that are less than 10,000 yrs old.

Display all sedimentary units with shear strengths (phi values) less than 35.

Display all sedimentary units with cohesive strengths less than 500lb/square ft.

Display all sedimentary units with bedding thickness less than 6 inches.

Display all sedimentary units for which the dominant lithology (> 50%) is sand.

Display all sedimentary units with more than 15% clay.

Display the attitude data for all sedimentary units that have a bed thickness less than 1 foot.

Display all polygons mapped as landslides in the Simi Valley East 7.5 minute quadrangle prior to the 1994 Northridge earthquake.

Display all polygons mapped as landslides in the Simi Valley East 7.5 minute quadrangle that were triggered by the 1994 Northridge earthquake.

Display the location of all mapped faults with Holocene displacement.

Display all metamorphic rocks that contain prograde hornblende.

Display all metamorphic rocks that contain prograde muscovite.

Display all metamorphic rocks that contain prograde garnet.

Display all intrusive igneous rock units.

Display all intrusive igneous rock units with published U-Pb zircon ages.

Display all intrusive igneous rock units with U-Pb zircon ages published after 1990.

Display all intrusive igneous rock units that contain magmatic hornblende.

Display all intrusive igneous rock units that contain magmatic muscovite.

Display all extrusive igneous rock units that contain sanidine.

Display all extrusive igneous rock units with sanidine 40Ar/39Ar ages published after 1985.

Display all NPS units in Utah containing Pennsylvanian rocks

Display all NPS units in Utah containing Pennsylvanian rocks with fossils

Display all NPS units in Utah containing Pennsylvanian rocks with fossil clams

Display a stratigraphic relationship of all the units exposed in the Grand Canyon and their textual descriptions

Display a picture of an outcrop of the shaly facies of the Brushy Basin Member of the Morrison Formation at Capitol Reef NP

Display all national parks in the US containing exposures of Cambrian rocks

Display all sand deposits in California NPS units

show all oil well locations in Big Southfork NP

show all abandoned mines in Mojave NP awaiting reclamation

Display an index map listing all the geologic quadrangles at Glen Canyon NRA at 1:24,000 scale

Display all references and map notes that were cited to compile the geology of a certain park

Display all contact metamorphosed zones containing marble or talc in Death Valley NP

Generate a map listing geologic hazard potential in all canyons of Zion NP

Generate a geologic cross section across the Black Canyon of the Gunnison River

Display economic mineral potential locations of the commodity selenite in Capitol Reef NP

Display all active mines and/or wells in Nevada

Display all bentonite susceptible units that cross major roadways in National Parks (i.e. Mancos Shale !!!)

Display recent shorelines to show dune migrations and beach erosion at North Carolina's Outer Banks

Display rockfall potential in relation to specific map units

Display all recent volcanic eruptions and flows (< 2000 years ago)

Display areas of sausseritic alteration

Display areas of sericitic alteration

Display areas of propylitic alteration

Display areas of greissinization

Display rock units in which coal beds are interlayered with sandstone and organic mudrock beds

Display rock units containing petroliferous blebs and (or) stringers

Display rock units containing elevated rare-earth element abundances

Display rock units with Sr(initial) ratios greater than .706

Where are slightly consolidated surficial deposits? Moderately consolidated? Well consolidated?

Display late Pleistocene shorelines of Lake Bonneville

Display spatial patterns of crestlines for Holocene barchan dunes

Display spatial patterns of crests of Pleistocene terminal moraines

Display spatial patterns of crests of Pleistocene lateral moraines

Display rock units that have exfoliating structure

Display Paleozoic rock units that contain fossils having Appalachian provincial affinities

Display Paleozoic rock units that contain fossils having Hercynian provincial affinities

Display Tertiary rock units that contain fossils having Tethyan provincial affinities

Display rock units containing trilobite faunas of the XYZ trilobite biomere of Palmer

Display marine sedimentary rocks containing benthic foraminiferal faunas of the Mohnian Stage

Display all equigranular plutonic rocks of tonalitic composition

Display all rapakivi-textured hypabyssal and plutonic rocks

Display all rapakivi-textured plutonic rocks

Display all porphyritic plutonic rocks where K-spar is the phenocryst

Display granitic intrusions into limestone that are associated with skarn occurrences

Display slickenside lineations

Display lineations created by crushing and streaking of mineral grains

Display stretching lineations

Identify all contacts that meet the map-accuracy standard

Identify all sedimentary contacts

Identify all sedimentary contacts that overlap the XYZ granite

Display all intrusive rocks with plagioclase composition An30-An40

Display all Proterozoic rock units that are part of a mangerite-jotunite complex

Display plutonic rock units that weather into tors

Display all intrusive rocks that have schlieren

Display granodiorite that contains inclusions of any kind

Display granodiorite that contains equidimensional inclusions

Display granodiorite that contains flattened and aligned inclusions

Display all volcanic rocks having ophitic texture

Display all intrusive rocks that are flow-lineated

Display volcanic rocks formed in island-arc settings

Display plutonic rocks formed in anorogenic continental-interior settings

Display calc-alkaline igneous rocks

Display synorogenic plutonic rocks

Display synorogenic plutonic rocks of Andean-margin type

Display synorogenic volcanic rocks in the upper plate of Tertiary detachment faults

Display synorogenic volcanic rocks in Miocene extensional nonmarine basins

Display all greenschist-facies rocks metamorphosed in late Cretaceous-early Paleogene time

Display all rocks metamorphosed in late Proterozoic time

Display rocks having two prograde metamorphic ages

Display rocks having mid-Proterozoic prograde upper amphibolite metamorphism followed by late Proterozoic retrograde metamorphism to greenschist facies

Identify all contacts where the geologist is not certain whether the planar feature is a contact or a fault

Identify all contacts whose location meets the stated map-accuracy standard

Identify all faults whose location meets the stated map-accuracy standard

Identify all sedimentary contacts formed during the Kaskaskia onlap sequence

Identify all igneous contacts formed during the late Cretaceous part of the Laramide Orogeny

Display slickenside lineations trending between 045 and 115

Display slickenside lineations on low-angle normal dip-slip faults

Display paleocurrent lineations between 115 and 180

Display sole-mark lineations between 115 and 180

Display all low-angle faults, whether contractional or extensional

Display thrust faults that have been folded

Display Cretaceous thrust faults that were reactivated in Eocene time

Display segments of the Vincent-Orocopia-Chocolate Mountain thrust system that were re-activated by Oligocene-Miocene extension

Select all symbols for overturned syncline

Select all symbols for upright anticline

Select all double-arrow symbols for right-lateral strike-slip faults

Select all bar-and-ball fault symbols

Select line-symbols for “contact, meets the map accuracy standard”

Display fold-axial planes overturned to the SW

Select all symbols for subsurface-boring locations

Display ground fissures

Display crown scarps for landslides

Select marble that originally was chert-rich limestone

Select marble that originally was “pure” high-calcium limestone

Select marble that originally was high-magnesium dolostone

Select metaquartzite that originally was medium to coarse grained high-silica shore-face dune sand

Select biotite schist that is coarse grained

Select chlorite schist that is fine to medium grained

Select quartzose hornfels that contains <5% biotite

Select actinolite-chlorite schist interlayered with muscovitic quartzofeldspathic schist

Select schist and gneiss containing porphyoblasts of cordierite

Select Mesozoic orthogneiss containing porphyroclasts of potassium feldspar

Select rock units that have deformational fabrics transitional between brittle and ductile

Select rock units that have cataclastic deformational fabrics and are cut by low-angle listric faults

Select rock units that display S-C indicators

Select rock units that have mylonitic deformational fabrics and display S-C indicators

Select rock units that have mylonitic deformational fabrics and also have mullion structures

Select orthogneiss units that preserve porphyritic fabric

Select greenschist-facies metasedimentary rocks that contain original sedimentary structures

Select metasedimentary terranes metamorphosed to blueschist conditions in subduction zones

Select orthogneisses that originated as monzogranitic high-level plutons

Select metagraywacke that originated as turbidite sands

Select argillite that originated as basin-plain siliceous mudrock

Select metachert

Select greenstone that originated as basalt flows

Select areas where the XYZ orthogneiss cross-cuts the XRAY schist

Select areas where the XRAY schist and the PQR greenstone appear to be depositionally stacked rather than structurally stacked

Where are rocks metamorphosed to upper greenschist facies and higher?

Select gneiss units that have sedimentary protoliths

Select metasedimentary rocks metamorphosed adjacent to plutonic intrusions

Select metamorphic rocks formed in continental-collision zones

Where do metamorphic rocks occur beneath the XYZ thrust plate?

Select surficial deposits that have depositional morphology preserved

Select surficial deposits that have no depositional morphology preserved

Select alluvial deposits that have buried soils

Select alluvial deposits having well developed argillic horizons

Select alluvial deposits having moderately developed K horizons

Select alluvial deposits having a strong K-IV horizon within 3 m of the surface

Select all alluvial deposits except for alluvial-fan deposits

Select all hillslope materials and colluvium except those formed by sheet-wash processes

Select colluvial materials but not those formed by sheet-wash processes

Select sand and gravel units where the gravel:sand ratio exceeds 2:1

Select sand and gravel units where the average clast size is <5 cm

Select sand and gravel units where the gravel:sand ratio exceeds 2:1 and where the average clast size is <5 cm

Select sand and gravel units where the clasts consist of unweathered metavolcanics

Select sand and gravel units where the clasts are highly weathered granitic and metamorphic rocks

Select alluvial-fan deposits where debris-flow deposition dominates over stream-flow deposition

Select lacustrine near-shore and bar deposits

Distinguish deposits of alpine glaciers from those of continental glaciers

Distinguish outwash-plain deposits from morainal deposits

Distinguish proximal alluvial-fan deposits from distal alluvial-fan deposits

Distinguish alluvial-valley deposits from alluvial-fan deposits

Distinguish braided-stream deposits from meander-belt deposits

Distinguish pro-delta deposits from delta-front deposits

What units have combined ledge-forming and slope-forming weathering profiles?

What crop out as recessive slope-formers?

What units crop out as prominent hogbacks?

What units crop out as resistant ledge- or cliff-forming units?

What units form badlands geomorphology?

Select all white, coarsely crystalline limestone

Select thick-bedded sandstone that is reddish colored

Select map units consisting mainly of ironstone

Select units of thinly laminated to thin-bedded limestone interlayered with lenses of fissil shale

Select units consisting homogeneously of lenticular thick- to very thick-bedded sandstone and pebbly sandstone

Select units containing varved mudrock

Select sandstones classified according to Folk (1968)

Selected sandstones classified according to Pettijohn ()

Select sandstones classified according to McBride ()

Select sandstones classified according to Friedman ()

Select carbonate rocks classified according to Dunham (1962)

Select carbonate rocks classified according to Bathurst

Select carbonate rocks classified according to Friedman

Select carbonate rocks classified according to Folk (1968)

Select sedimentary rocks classified according to Folk (1968)

Select sedimentary rocks classified according to Pettijohn ()

Select all Paleozoic sedimentary units that are predominantly composed of dolostone

Select units consisting mainly of bioclastic limestone

Select map units consisting of turbidite deposits

Select map units containing limestones dominated by mud-supported depositional fabrics

Select map units containing limestones dominated by grain-supported depositional fabrics

Select map units containing sandstones having eolian cross bedding

Select map units containing sandstones having graded bedding

Select map units containing sandstones having graded bedding and dominated by base-truncated Bouma BCD intervals

Select map units dominated by matrix-supported pebbly conglomerate and sandstones having graded bedding and Bouma AB intervals

Select map units containing sandstones having sole marks

Select map units containing conglomerate having matrix-supported depositional framework

Select map units containing sandstones having cross-laminations classified according to Allen ()

Select map units containing mudrock and fine sandstone displaying mudcracks

Select map units containing sedimentary fining-upward cycles

Select map units containing sedimentary coarsening-upward cycles

Select formation-rank map units in which coarse-sandstone dominated facies pass laterally into sandstone-and-mudrock facies without changing formation name

Select map units having containing conglomeratic sandstone containing mud chips

Select map units dominated by sandstone having between-grain argillaceous “matrix”

Select rock units in which the prevailing sandstone-body geometry is shoe-string sands

Select rock units in which the prevailing sandstone-body geometry is sheet sands

Select Miocene submarine-fan deposits of Tertiary marine basins in the California Coast Ranges

Select Miocene submarine-fan deposits of Tertiary marine basins in the California Coast Ranges, but restrict the search to proximal-fan facies

Select Miocene submarine-fan deposits of Tertiary marine basins in the California Coast Ranges, but restrict the search to mid-fan facies

Select Mesozoic forearc nonmarine sedimentary deposits

Select Mesozoic forearc marine sedimentary deposits

Select Mesozoic back-arc deposits containing gravity-slide blocks

Display all terrace alluvium with calcrete soil > stage IV

Display all terrace alluvium deposits with upper surface between 10 and 20 m above stream level.

Display all high-angle faults within 2 km of the Wasatch Mountain front that have a rake of 45 to 60 degrees

Display all faults that offset only the youngest alluvium

Display all eolian deposits more than 1 m thick that lack significant soil development

Display all marine terraces 20 to 80 m above sea level that have reliable U-series dates < 130 ka

Display all areas that have impermeable deposits within 2 m of the surface and slopes less than 3%

Display areas where younger alluvial fans slope more steeply than older ones

Display areas where basaltic cobbles have been observed in the conglomerates of the Muddy Creek Formation

Display areas where steeply dipping sedimentary rocks are buried beneath less than 3 m of unconsolidated sediments

Display all faults that truncate or offset faults of late Pliocene or younger origin.

Display all faults with damage zone wider than 2 m where the damage zone is not plugged

Display all areas that are within 2 km of and lower than landslide deposits with documented movement within the last 100 years

Display all gradational contacts separating marine and terrestrial sediments

Display all areas where reversal of dip direction within Pliocene sandstones occurs within 1 km

Display all lacustrine beds that contain Lava Creek B tephra

Display areas where diamictons less than 2 m thick overlie well bedded, well sorted deposits

Display fault scarps that slope 15 to 25 degrees in playa deposits

Display 20 to 30 Ma lacustrine limestones that have orthogonal joint sets

Areas where 12 to 17 Ma old welded ashflow tuffs contain chloritized conglomeratic clastic dikes

Display all plutonic felsic rocks that have porphyritic textures with a fine-grained groundmass

Display all plutonic felsic rocks with 2 micas

Display all plutonic felsic plutons that are polyphase or zoned

Display all Phanerozoic mafic to ultramafic plutonic igneous rocks associated with calc-alkalic convergent margin magmatism that have cumulate textures

Display all Archean and Proterozoic mafic to ultramafic plutonic igneous rocks that have cumulus layering, particularly cyclic units or macrorhythmic layering

Display all tectonized harzburgites that are part of an ophiolite assemblage

Display all pillow lavas associated with the Coast Range ophiolite

Display all calderas in the western United States

Display all tuffs associated with the Thunder Mountain caldera in Idaho, distinguishing those that are intracaldera from those lying outside the caldera margin

Display all occurrences of obsidian that are not devitrified

Display all fine-grained siliciclastic sedimentary rocks that are organic-rich

Display all sedimentary rocks which contain abundant, well preserved trilobite fossils

Display all sedimentary rocks deposited in intertidal depositional environments

Display all sedimentary rocks that are made up of turbidites

Display all sedimentary rocks that show evidence for syndepositional deformation

Display all sedimentary rocks that form massive, cliff forming units

Display all sedimentary rocks that are porous and permeable

Display all metamorphic rocks derived from felsic, igneous plutonic protoliths

Display all metamorphic rocks that have relict sedimentary structures

Display all sedimentary rocks that contain garnet

Display areas of seafloor that are covered with gravel

Display areas of seafloor that are gravelly AND lie in water depths of less than 30 m

Show me the interface between areas of rocky seafloor and muddy seafloor

Display the thickness (isopach) of sand on the shoreface

Display the age of surficial materials on the shelf

Display areas of high relief on seafloor (i.e., rugged bathymetry)

Display areas of Chesapeake Bay that are actively dredged

Display all dredge-spoil disposal sites

Show me beaches in North Carolina that are eroding at rates of 1 m/yr or faster

Show me segments of beach that are stable or growing seaward

Display landslides in San Mateo County, California

Display landslides that directly impact the coastline

Display all landslides that lie on active faults

Display all landslides that are larger than 1 km^2 AND have been historically active

Show me urban areas that are built on artificial fill

Show me areas that are highly susceptible to earthquake-induced liquefaction

Display the location of all geotechnical borings

Display the core logs, engineering data, etc for a selected boring(s)

Show me the areas in Hawaii at risk from large tsunamis

Display the distribution AND age of known lahar deposits in Washington

Select all the welded tuff with a fracture density > X%.

Select all the volcanic units within X km of an intrusion.

Select all the units altered by an intrusion.

Select all the zeolitized units.

Select all vitric rocks.

Select all the Cenozoic surficial deposits that are well sorted and unweathered within Xm of the surface.

Select all the crystalline rocks with a fracture density > X% and within X m of the land surface.

Select all the carbonate rocks within X km of a fault.

Select all rocks that are part of a thrust plate.

Select all the clastic rocks that are not carbonate and that are part of a thrust plate.

Select all carbonate rocks with > X% fine grained material.

Select places where Proterozoic clastic rocks are in the upper plate of a low-angle normal fault.

Select places where welded tuffs are cut by normal faults with greater than 100 m offset.

Show all densely welded (or moderately welded, or nonwelded) tuffs. (To answer this question, variations in the degree of welding would need to be attributed within all of the tuff units on a map.)

Select all faults with trace lengths greater than X km.

Select all faults that have offsets greater than X m.

Select all strike-slip faults.

Select all normal faults with dips greater than 50 degrees.

Select all faults oriented between N10E and N70E.

Show all Tertiary basin-fill that is dominantly coarse-grained.

Select traces of low-angle normal faults that have metamorphic rocks in their lower plate.

Select regions where Tertiary rocks dip steeply (greater than 60°, for example) to the west.

Select all carbonate rock that has been tectonically brecciated. (Again, this is an important question, that would rely on some sort of uniform criteria for characterizing "tectonic brecciation" -- otherwise it becomes highly subjective).

Select mapped faults in Tertiary rocks that correspond to steep gradients in gravity or magnetic data.

Select all normal faults with hanging wall damage zones wider than 100 m.

Select all stratigraphic units at the bedrock surface in quad X.

Select all outcrop photographs available for quad X

Select all stratigraphic cross sections for quads X

Select all references sited for quad X

Select all subsurface datum points in quad X

Select all plugged and abandon drill holes and county number for quad X

Select all producing wells and county number in quad X

Select all lithologic symbols and their meaning for quad X

Select all sites where strikes and dips have been taken in quad X

Select all formation symbols in quad X

Select all drill holes for which there is a core in quad X.

Generate a list of all stratigraphic units represented in drill core A from quad X

Generate a stratigraphic column of rocks exposed in quad X

Generate structural contours of stratigraphic unit B in quad X

Generate a description of all lithologic units in quad X

Develop a list of fossils identified in stratigraphic unit B in quad X

Generate a listing of all previous mapping in and adjacent to quad X

Generate all geologic text available for quad X

Select all quarries in quad X

Select all anticlines in quad X

Display a map showing all the eskers.

Display a map showing the lowest most till in the Teays buried valley.

Display a map showing all the Pre-Illinoisan till.

Select all the polygons that have three or more tills stacked upon each other.

Display a map showing the Pleistocene lacustrine silt that is well laminated.

Select all the outwash sand & gravels that occur between two till units.

Display a map of all the peat deposits.

Display a map of all the till units that outcrop along the shore of Lake Erie.

Display all the contacts of the sand & gravel units that are in contact with the carbonate bedrock units.

Find all the Pleistocene beach ridge sands that overly outwash sands & gravels.

Select all the till units that contain glacial erratics larger than 1 meter in diameter.

Display a map showing Pleistocene beach ridges that come in contact with the Lake Erie shoreline.

Display a map showing all the end moraines

Display a map showing all the end moraines and the ground moraines.

Display a map showing Loam Till with thin (<1 meter) loess cover.

Display a map showing where the organic deposits, > 6 meters thick, overly till of Wisconsinian-age.

Find all the polygons showing where the till is less than 5 feet thick over bedrock.

Display a map showing all the Wisconsinian-age Alluvial terraces.

Display a map showing all the Pleistocene beach ridges bordering Lake Erie.

Display a map showing all the ice-contact deposits (deposited directly from stagnant ice as kame and esker deposits).

Display a map showing the Darby till.

Display a map showing lacustrine sand, deposited in glacial lakes as shallow-water deltas.

Display a map showing where alluvium overlies till, which overlies sand & gravel in a buried valley.

Display a map showing Pre-Illinoisan, Illinois, and Wisconsinian lacustrine deposits.

Display a map showing the Powell end moraine.

Display a map showing polygons where till is less than 2 feet thick and is overlying fine-grained sand.

Display a map showing the boulder belts in the Darby till.

Display a map showing the Holocene-age alluvium and the Wisconsinian-age alluvial terraces.

Display a map showing the sand & gravel deposits in the buried valleys that are deeper that 400 feet beneath the surface.

Display a map showing the polygons having two or more sand & gravel units, stack upon each other, separated by impermeable till units, and located within buried valleys.

Select all surficial deposits with a high/low infiltration rate.

Show the regional water table and corresponding formation. Is it structurally or stratigraphically controlled?

Show perched water zones. Are they stratigraphically controlled?

Display formations that have sustainable ground water yields greater than 10 gpm. How extensive are they?

Display the distribution of low permeability zones.

Display the extent (vertical & horizontal) of unconsolidated deposits.

Display regional joint and fracture patterns in the consolidated units.

Show the unconsolidated units with a high/low total organic carbon content.

Plot the distribution of ground water wells within an area. In which units are the wells screened?

What are the sustainable yields of the formations intersected by the wells?

What is the extent of a specific watershed? (How does my target property fit within the distribution of the watershed?)

Historically, what is the seasonal fluctuation of the ground water table? How has this fluctuation changed over time?

ID regional ground water recharge and discharge areas.

ID abandoned wells within an area.

ID potential anthropogenic contaminant transport pathways: underground utilities, mine workings, fill areas, wells, surface/ground water control structures, etc.

ID all clay units (vertically and horizontally) with the following criteria: >25 % by weight max. dimension of 0.002 mm; >50 % by weight passing 200-mesh sieve; and have a plasticity index > 10.

Show the distribution of USCS classifications in the unconsolidated units.

Display all slopes with a grade steeper that 6% and the corresponding USCS classification.

Show the extent of unit X in my study area.

Show the thickness of unit X in my study area.

Show the depth to unit X in my study area.

Show the extent of unconsolidated deposits greater than 3 m thick in study area.

Show the extent of unconsolidated deposits with a permeability greater than XXX.

Show the thickness of unconsolidated deposits with a permeability greater the XXX

Show the extent of fractured rock in study area.

Show the fracture-trace/orientation of fractures in unit.

Show the depth to ground water in unit X in study area.

Show the extent of lacustrine deposits in study area.

Show the thickness of lacustrine deposits in study area.

Show the extent of glacial sand & gravel deposits in study area.

Show the depth of glacial sand & gravel deposits in study area.

Show the distribution of buried river channels/fluvial deposits in study area.

Show the depth to buried river channels/fluvial deposits in study area.

Show the extent of clay units with a permeability less than XXX.

Show the depth to and thickness of clay units with permeability less than XXX.

Show the extent of rock units with permeability greater than XXX.

Show the depth and thickness of rock units w/ permeability greater than XXX.

Show the extent of units identified as regional and local aquifers.

Amount of available recharge

DRASTIC rating

Determine the length (amount) of well casing needed for deposits of a given type

Maximum sustainable yield

Areas with flowing (artesian) wells.

Confined aquifers and depth to confining units

Areas of known oilfield/brine contamination at X depth

Areas of mineable sand and gravel deposits with x amount of till cover or lesslake plain areas with till vs. lacustrine sediments

Areas of estuarine deposits

Areas of beach ridge/dune deposits

Areas where till, surficial deposits are believed to be saturated below X feet.

Areas where fracturing in till is known or suspected

Historic potentiometric surface maps derived from a point coverage of well log data for wells drilled within a certain time period.

High yielding well locations for wells completed in a particular aquifer.

Maps showing extent of areas served by private water systems and other wells within those areas to assist in determining ground water stress areas.

Saturated thickness maps of aquifers.

Drift thickness maps.

Coarse grain unconsolidated deposits >10' in thickness.

Good base maps in the form of hypsography, DEM, and orthophotos.

Maps of gaining or losing streams.

Aquifer extent delineations.

Basin delineations.

Delineations of confined and unconfined aquifers.

Maps of spatial variability in aqueous chemistry.

Maps of hydraulic conductivity and specific capacity.

Maps of soils and soil infiltration rates.

Bore hole data.

Spring elevations.

Vadose Materials.

Recharge, and Discharge areas.

query deepest underground source/formation of potable ground water

query depth to any given formation at a known location

query what percent of the state is immediately underlain by limestone

query what the recharge rate is for a particular area

Coverages of known fracture patterns and orientation of those fractures

Isopach maps of geologic formations.

Map of Buried Valleys

Display extent of known cones of depression

Display ground water velocity fields

Display vertical hydraulic conductivity of surficial till deposits

Display facies changes in formations/aquifers

What is the surficial material at this location?

What is the overburden thickness?

What is the uppermost consolidated formation (or where is this location in the section)?

What are the aquifer properties (transmissivity or hydraulic conductivity) of the upper 100 feet of material at this location?

What is the bedrock orientation (strike and dip) at this location?

Are there any major bedrock fractures or karst features that would affect ground water flow?

What were the past land uses of this area?

What are the current land uses of this area?

Where are the ground water users in this area?

Are there any know sources of ground water contamination at this location?

What is the ground water pollution potential at this location?

What well or boring logs are available for this area?

What are the nearest surface water bodies?

Where is the closest stream gauging station?

What is the local precipitation rate?

What are the soil types in the area?

Where is the closest government observation well?

What is the depth to ground water?

What is the ground water flow direction?

What references (geologic reports, master theses, etc...) are available for this area?

depth to groundwater

depth, thickness and potential yield of unconsolidated sand and gravel aquifers

depth, thickness and potential yield of bedrock aquifers

thickness of unconsolidated deposits

any permeability or hydraulic conductivity information on the units

proximity to surface waters

location, production, and unit completed within for private wells, public wells, and industrial wells

stratigraphic names applied to bedrock and unconsolidated units

geological age assigned to the units

oil and gas well locations, depth of completion, stratigraphic name of unit completed within and status

wellhead protection areas

reservoir protection areas

sole source aquifer locations

PHASE I data - proximity to landfills, hazardous waste generators, underground storage tanks both active and closed

previous investigation data - well and test boring data submitted to Division of Water

location of wetlands

Select faults that bound intrusive bodies and/or extend from faulted contacts of intrusive bodies.

Select faults that cut hydrothermally altered intrusive rock.

Select faults that intersect the boundaries of intrusive bodies.

Select faults that terminate at detachment surfaces at angles greater than 20°.

Select faults that cut detachment surfaces.

Select faults across which footwall rocks dip steeper than hanging-wall rocks.

Select axial plane traces that curve through more than 20° of arc.

Show traces of axial planes with more than 20° of curvature.

Select largest possible domains with dip-direction variations less than 90° where dips are toward a fault plane.

Select largest possible domains with opposite (>180°) stratal and foliation dip directions.

Select domains in which vertical planes extending 90° from fault traces would show faults cutting hanging-wall bedding at angles between 75° and 90°.

Select domains less than 10 km2 with opposite along-strike dip directions.

Select bedding and foliation attitudes with dip > 30° and dip directions between 45° and 125°.

Select polygons containing strata that strike > 20° toward a bounding basal depositional contact.

Select domains of metamorphic rock in which the attitude of foliation is < 20° from the attitude of contact with next oldest unit.

Select cross section lines that intercept folds at their greatest amplitude.

Select shorelines with slopes > 35° formed on shale or mudstone.

Select bedrock mountain fronts with slopes > 35° more than adjacent piedmont slopes formed on surficial deposits.

Select paved roads with slopes >2° on mudstone or shale.

Select upper-plate rocks of detachment faults on which slopes of > 35° are formed.

Display a map showing all the oil & gas fields.

Display all of the Oriskany Sandstone oil & gas fields.

Select all the oil & gas fields that have a stratigraphic trapping mechanism.

Display a map showing the porosity pinch-out in the Oriskany Sandstone fields.

Display all the Knox Dolomite oil & gas fields that have faulting as a trapping mechanism.

Display the net thickness of the Clinton sandstone.

Display all the anticlines in the Berea Sandstone that do not have an expression at the surface.

Select all the Clinton sandstone fields that are deeper than 8000 feet.

Display the Rose Run sandstone subcrop.

Display the oil-water contact in the XYZ field.

Select all the gas wells whose initial production was greater than 1,000,000 cubic feet and are located within a quarter mile of a fault that is only located within the subsurface.

Display a map showing the permeability in the Berea Sandstone fields.

Display a map of the second Berea sand in Gallia, Meigs, Athens, Morgan, and Muskingum Counties, Ohio (this example comes from U.S. Geological Survey Professional Paper 259, Plate 2).

Display a map showing extent and thickness of the Berea, Cussewago (Murrysville), and Corry sands in the Appalachian Basin (this example comes from U.S. Geological Survey Professional Paper 259, Plate 1).

Display a map showing the Grenville Front in the subsurface of Ohio.

Display a map showing where the Grenville Front coincides with the Bowling Green Fault.

Display a structure contour map of the Precambrian unconformity in Ohio.

Select all the Precambrian faults that propagate up into the Paleozoic sediments and are associated with oil & gas fields.

Display all the Silurian pinnacle reef oil & gas fields.

Select all the oil & gas fields that produce H_2S gas.

Display the H2S gas distribution in the XYZ field.

Display all the oil & gas fields of the Berea Sandstone that are located within 1 mile of the outcrop.

Display a map of the available coal resources of the Bethesda quadrangle.

Display a map showing the mined-out resources of the Upper Freeport coal bed in Ohio.

Display a map showing sulfur concentrations in the Pittsburgh coal bed.

Select all the cannel coal locations.

Display a map showing the Southern Anthracite coalfield.

Display a map of the upper and lower splits of the Middle Kittanning coal bed.

Display a map showing the thickness between the upper and lower splits of the Middle Kittanning coal bed.

Display a map showing the overburden thickness of the Upper Freeport coal bed.

Display the area of the Pittsburgh coal bed underlain by the Pittsburgh sandstone member.

Display the measured coal sections in Belmont County, Ohio.

Display an Isopach map of the Sharon coal bed.

Display a lithofacies map of the Pittsburgh sandstone member.

Select all the polygons of the Fishpot coal that are beneath the drainage.

Display all the paleochannels that have eroded away the Upper Freeport coal bed.

Select all the polygons of the Middle Kittanning coal bed that were deposited in a strandplain/barrier deltaic system.

Display a map of partings in the Middle Kittanning coal bed that are composed primarily of sandstone.

Display a map of the cleat orientation in the Pittsburgh coal bed throughout Ohio.

Display a map of the cleat spacing in the Pittsburgh coal bed through Ohio.

Display Miocene fragmental andesites

Display all Holocene strike slip faults

Display all faults that dip less than 30 degrees

Display mylonitic shear zones

Display landslide deposits

Display all normal (dextral strike-slip, sinistral strike-slip, reverse, thrust, oblique-slip) faults.

Display all faults having slickenline (slickenside striation) rakes ranging from (greater than, lesser than) __o to __o .

Display all faults having dips (strikes) ranging from (greater than, lesser than) __o to __o .

Display all faults having displacements (offsets, separations) ranging from (greater than, lesser than) __m to __m.

Display all fault zones that are wider than (narrower than) __m.

Display all fault zones that are (carbonate, silica, gypsum, etc.) cemented.

Display all fault zones that have clay (gouge, brecciated) cores.

Display all fault zones that have fractured (folded, brecciated, vein-rich) damage zones.

Display all mesoscale (outcrop-scale) faults.

Select all carbonate rocks having > X% fine grained material.

Select all carbonate rock that has been tectonically brecciated. (Again, this is an important question, that would rely on some sort of uniform criteria for characterizing "tectonic brecciation" -- otherwise it becomes highly subjective).

Display a map showing all the Pre-Illinoian till

Display a map showing Pre-Illinoian, Illinoian, and Wisconsinian lacustrine deposits

Calculate the amount of available recharge (using this geologic-map database)

Determine the DRASTIC rating

Calculate maximum sustainable yield (using this geologic-map database and appropriate related databases)

Show areas having flowing (artesian) wells

Show confined aquifers and display depth to confining units

Show areas of known oilfield/brine contamination at X depth

Show areas of mineable sand and gravel deposits with x amount of till cover or lesslake plain areas with till vs. lacustrine sediments

Show areas of estuarine deposits

Show areas of beach ridge/dune deposits

Show areas where till, surficial deposits are believed to be saturated below X feet

Show areas where fracturing in till is known or suspected

Show historic potentiometric surface maps derived from a point coverage of well-log data for wells drilled within a certain time period

Show high-yielding well locations for wells completed in a particular aquifer

Generate derivative maps showing extent of areas served by private water systems and other wells within those areas to assist in determining ground-water stress areas

Derive saturated-thickness maps of aquifers

Show drift-thickness maps

Select coarse-grained unconsolidated deposits >10' in thickness

Show areas where good base maps in the form of hypsography, DEM, and Orthophotos are available

Generate maps of gaining or losing streams

Show aquifer-extent delineations

Show basin delineations

Generate maps showing spatial variability in aqueous chemistry

Generate maps showing hydraulic conductivity and specific capacity

Generate maps showing soils and soil infiltration rates

Generate maps showing bore-hole geotechnical data

Generate maps showing the elevations of springs

Generate maps showing vadose materials

Generate maps showing recharge and discharge areas

Select for known fracture patterns and indicate the orientation of those fractures

Generate isopach maps of specific geologic formations

Generate a map of buried valleys

Display ground-water velocity fields

What is the surficial material at this location?

For the selected region, are there any major bedrock fractures or karst features that would affect ground water flow?

Where are the ground-water users in this area?

Are there any know sources of ground-water contamination at this location?

What is the ground-water pollution potential at this location?

Where is the closest stream-gauging station?

What is the depth, thickness and potential yield of unconsolidated sand and gravel aquifers?

What is the depth, thickness and potential yield of bedrock aquifers?

What is the thickness of unconsolidated deposits?

Display permeability and (or) hydraulic conductivity information for the selected map units

Calculate proximity to surface waters

Display location, production, and unit completed within for private wells, public wells, and industrial wells

List stratigraphic names applied to bedrock and unconsolidated units for the selected area

List geological age assigned to map units in the selected area

Display oil and gas well locations, depth of completion, stratigraphic name of unit completed within and status

Display wellhead-protection areas

Display reservoir protection areas

Display sole-source aquifer locations

Display PHASE I data - proximity to landfills, hazardous-waste generators, underground storage tanks (both active and closed)

Display previous well and test-boring data submitted to Division of Water

Display location of wetlands

Select all the channel coal locations

Display all normal faults(also dextral strike-slip, sinistral strike-slip, reverse, thrust, oblique-slip)

Show all faults having slickenline (slickenside striation) rakes ranging from (greater than, lesser than) __° to __°

Display all faults having dips (strikes) ranging from (greater than, lesser than) __° to __°

What are the rocks in my back yard? (age, unit, lithology)

What is under my house. This would start with the soil under the house, but could extend down to "China"

What would a cross section from an arbitrary point A to an arbitrary point B look like (cross section on the fly)?

What rocks (age, map unit, lithology) would you encounter traveling from point A to point B?

How old are the rocks at an arbitrary point?

What are the rocks made of?

How were the rocks made?

What other things are in the rocks? (fossils, minerals, etc.)

How do rocks in an arbitrary area relate to one another?

Have the rocks in an arbitrary area been moved since they were formed? (faulted or tilted)?

What can the rocks be used for?

How do the rocks break down? (i.e. saprolites)

What drainage patterns do the rocks form?

Is there bedrock near the surface or are there unlithified surficial deposits?

How deep is it to the water table(s)?

What is the permeability of the rocks?

Is the ground water being recharged?

Where would a pollution source go if spilled?

Are there hazards related to the geology?

How strong are the rocks here?

Are there faults in the area? Are they active or inactive?

What rocks are considered aquifers?

What are the water-bearing characteristics of the rocks?

Are the rocks fractured?

What are the fractures like? (Open or closed)

Are there linear features on the map?

Where are lithologies (of a specified type) on the map?

Where are mineral assemblages (of a specified type) on the map?

What is the water chemistry like (in a specified area)?

Is the ground water (in a specified area) potable?

Are there economic mineral deposits? Where are they? How deep are they?

How deep is saline water? (Close enough to the surface to cause water well problems?)

What rocks are prone to landslides or slope instability?

Do limestones form caverns? If so how large?

Do limestones form karst terraines? If so what is the sink-hole density?

How thick are the rock units (map units)?

What are the bedding characteristics?

How deep is bedrock?

Where are springs located?

Where are general rock types? Sedimentary, intrusive igneous, extrusive igneous, metamorphic?

Where are rocks deposited in a marine or non-marine environment?

How deep is the metamorphic basement?

What are coal chemistry and physical characteristics?

What is the relationship of the 'boundary' between these strata?

How does the lithology vary in depth and distance / direction?

What is the movement of groundwater and other fluids?

What is the diagenetic / metamorphic history of this region?

What is the erosional history of this region?

How does the lithology vary in time?

What were the conditions of deposition?

What are the (tectonic) pressures and stresses?

Where are sand and gravel deposits out of floodplains?

Where are tills or lake deposits less than 15 feet thick?

Where does the Fox Hills Formation pinch out?

Where do sandstone aquifers come to the surface?

What are the geologic-map constraints on the ages of faults?

What does this area look like if we simplify the geology?

Can I simplify it in different ways?

Can I define my own simplification scheme?

What is the structural relief on the top of the lower Pleistocene?

Who measured that strike-and-dip?

Was the light any good when this measurement was made?

What facing indicator induced the geologist to put a ball on the end of the strike line?

Does a ball on the end of the strike line mean a facing indicator was observed and interpreted confidently?

How confident is the interpretation of facing direction at this site?

Was that contact seen on the outcrop, on an aerial photograph, or inferred by somebody sitting at a desk?

What are alternate interpretations of this geology?

A prospective buyer wanted to know if my house is in liquefaction-prone young alluvium or not. I just looked at the State geologic map with Internet Explorer (or MapGuide, or ...) and zoomed in until I could see that it is. This may queer the sale (and I think it is wrong!). If the sale falls through because of this, who do I sue?

What does the map look like if I make all the Tertiary rocks different shades of orange and brown?

What portion of the geologic mapping shown on this area was funded by my agency?

What is the mineral potential of that area?

Are all mineral occurrences indicated? Or only a subset?

Have all the mines pits and shafts been indicated?

Are there any age dates available for any of the rocks in the area?

Are there any chemical analyses available for rocks from the area?

How detailed was the mapping compiled to produce the map?

Who did the geologic mapping, and when, using what set of aerial photographs?

Are the geologic contacts interpreted from field observation, aeromagnetic maps, drilling data, etc?

Where is the indicator alteration and mineralization suggestive of a particular sort of mineralization (PCD, VMS, epithermal gold, etc.) ?

Do the map units represent original lithology (protolith), or are they metamorphic rock units?

What written literature is available about the area?

What published geologic maps include the area?

Is there a surficial geologic map for the area?

What are the major terrane boundaries and structures in the area?

Display the metamorphic isograds

What is the distribution of potential outcrop of the bedrock units?

What is the sequence of intrusive events?

Which faults are the oldest?