School/Team Name:_____Team #_____

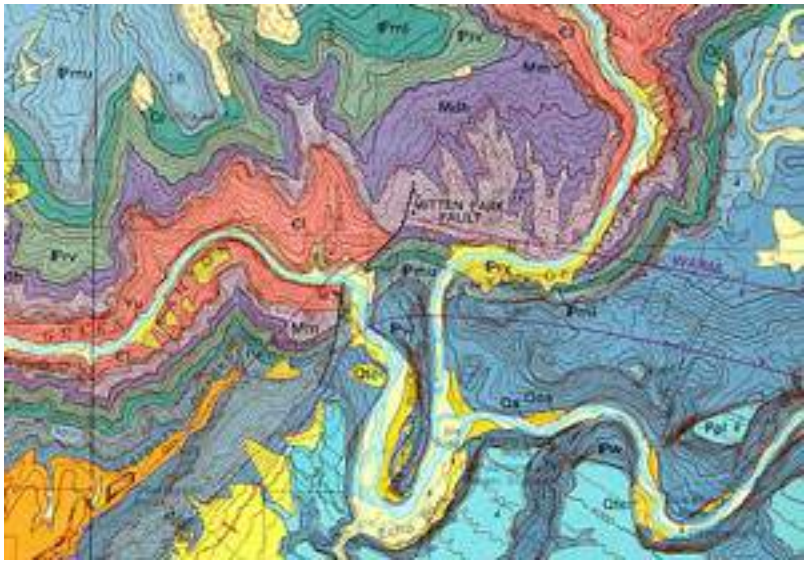
Students Names: _____

GeoLogic Mapping

State Science Olympiad Tournament

TAMU - April 25, 2015

Event supervisor: Enrica Quartini



- *All answers must be written **clearly** on the **answer sheet***
- *You can detach the pages of the test and answer sheet but must return them stapled back together in the **right order***
- *Questions are worth 1 point each unless specified differently*

DO NOT OPEN
until instructed to do so

MAP 1 : questions 1) to 8) (23 pt total)

1) Draw a cross section, with topographic profile every 400m, along A-A' **(10 pt, T1)**
2) What is the contour spacing (in meters)? (0.5 pt)
3) What is the true thickness of unit Js in meters? (2pt)
4) a) How many hydrological divides can you count in the picture?
   b) Draw them the on the map (*here on the test!!*) (2pt)
5) a) How many geographical and projected coordinate systems are shown on the map? (2pt)
6) a) Which unit is the oldest? (0.5 pt)
   b) What two pieces of information did you use to answer question a)
7) a) Which unit is likely the youngest?
   b) Which unit is likely the second youngest?
   c) Which unit is the third youngest?
8) What Era does each unit in the map correspond to?

MAP 2 : questions 9) to 11) (11.5 pt total)

9) Name labels A-G (3.5 pt)
10) Answer T (True) or F (False) to the following statements (0.5 pt each):
    a) the same tectonic process is likely to have created C, D , and G
    b) C and D are likely coeval
    c) the stress field changed from compressional to extensional
    d) Xx is likely not deformed
    e) all units have been deformed by at least one stress field
    f) there is an angular unconformity between Xc and Xf
11) Number and describe in details the order of geological events and processes that took place in this region **(5 pt, T3)**

MAP 3 : question 12) (4 pt total, T5)

12) a) Is the topography of this area a ridge or a valley?
    b) Which way are the strata dipping? (2pt)
    c) Do all units have the same strike? (0.5pt)
    d) Do the beds dip shallowly or steeply? (0.5pt)

MAP 4 : question 13) and 14) (7 pt total)

13) a) Put units Kp, Kb, Kd, and Ke in the correct order of deposition (from oldest to youngest)
    b) Name two clues that gave away answer to a)
14) a) What is the orientation of Kd?
    b) Draw it on a stereonet **(4pt, T7)**

MAP 5 : questions 15) to 18) (7 pt total)

15) a) What symbol represents a thrust? Draw your answer on the answer sheet. (0.5pt)
b) Of the units affected by the thrust, which one is thrusting over the other?
c) Which unit likely contains the most amounts of mud and clay? (0.5pt)

16) a) Which unit is more likely to be affected by creep?
b) Name the 2 key factors that led to your answer to a)

17) In which area are houses or building most likely to have foundation issues? **(2pt, T9)**

18) Which of the following geological structures characterize the area?
a) monocline
b) anticline
c) syncline

Look at the OIL AND GAS MAP OF TEXAS and LAND-RESOURCES MAP OF TEXAS and answer the following questions (7 pt total):

19) a) Match each major oil basin to the major resource extracted there and the dominant rock type in the area (3pt)
b) Which of the three lithologies are siliciclastic and which are carbonate/calcareous?
c) Which of the three lithology types from question a) is likely the least permeable?
d) Which of the three lithology types from question a) is likely known to host unconventional oil reservoir?

20) Texas is not a seismically active state. Can you identify areas that are nevertheless likely to register a low level of seismicity and explain why?

Look at the OIL AND GAS MAP OF TEXAS and INDUSTRIAL MINERALS OF TEXAS map and answer the following questions (3.5pt total):

21) a) Which dominant rock type characterizes each major basin? (2 pt)
b) Which Major Basin is made of the oldest rock types? (0.5 pt)

22) Two basins are characterized by the occurrence of a peculiar type of structure/feature that is of great importance to oil production. Which feature is that?

Look at the AQUIFERS OF TEXAS map and answer the following questions (4.5 pt total):

23) a) Rank the top 3 aquifers in terms of spring discharges (from highest to lowest). (1.5pt)
b) Use the other maps of Texas available to you to say what *type* of aquifer they are

24) Use the other maps of Texas available to you to correlate the distribution of *confined aquifers* with *specific lithologies*. Explain your observation and report the *key words* that helped you in your analysis. **(2pt, T8)**

VAN HORN-EL PASO MAP: questions 25) to 37) (32.5pt total)

25) Calculate the topographic gradient at location A on the map.

26) a) Which of the locations marked on the map as B, C, D, and E is at the highest elevation? (0.5pt)
b) Which one is at the lowest elevation? (0.5pt)

27) a) What contact exists between formation Pl and Qal?
b) Which contact exists between Ti and Qal?
c) What contact exists between Ti and Ph

28) What morphological feature is centered at approximately 105° 53' 00", 31° 37' 00" ? **(2pt, T06)**
a) floodplain
b) river delta
c) terrace
d) alluvial fan
e) natural levee

29) a) What *type* of coordinates are those in question 28)?
b) Convert those coordinates into decimal.

30) To which era belong the most intensively faulted units?

31) What type of faults are the ones between units Qf and Pdb?

32) a) What unit helps you easily identify rivers at a glance when looking at this map?
b) That is true thanks to what standard adopted by most maps?

33) What is the scale of this map?

34) What panel in FIGURE 1 best represents the projection of this map?

35) What is the data source of sector B of this map? (0.5pt)

36) a) Which two units are interfingered?
b) Give an example of a process that would generate unit interfingeing. **(5pt, T4)**
c) What is the term used to describe rock layers that laterally thin to a point where they vanish?
d) In which paleo-environment were these units deposited?

37) Look at the maps of Texas available to you to answer the following questions (0.5pt each):
a) what industrial minerals are produced in the area of this map?
b) what aquifers are present in the area of this map?
c) what kind of aquifers are present in the area of this map?

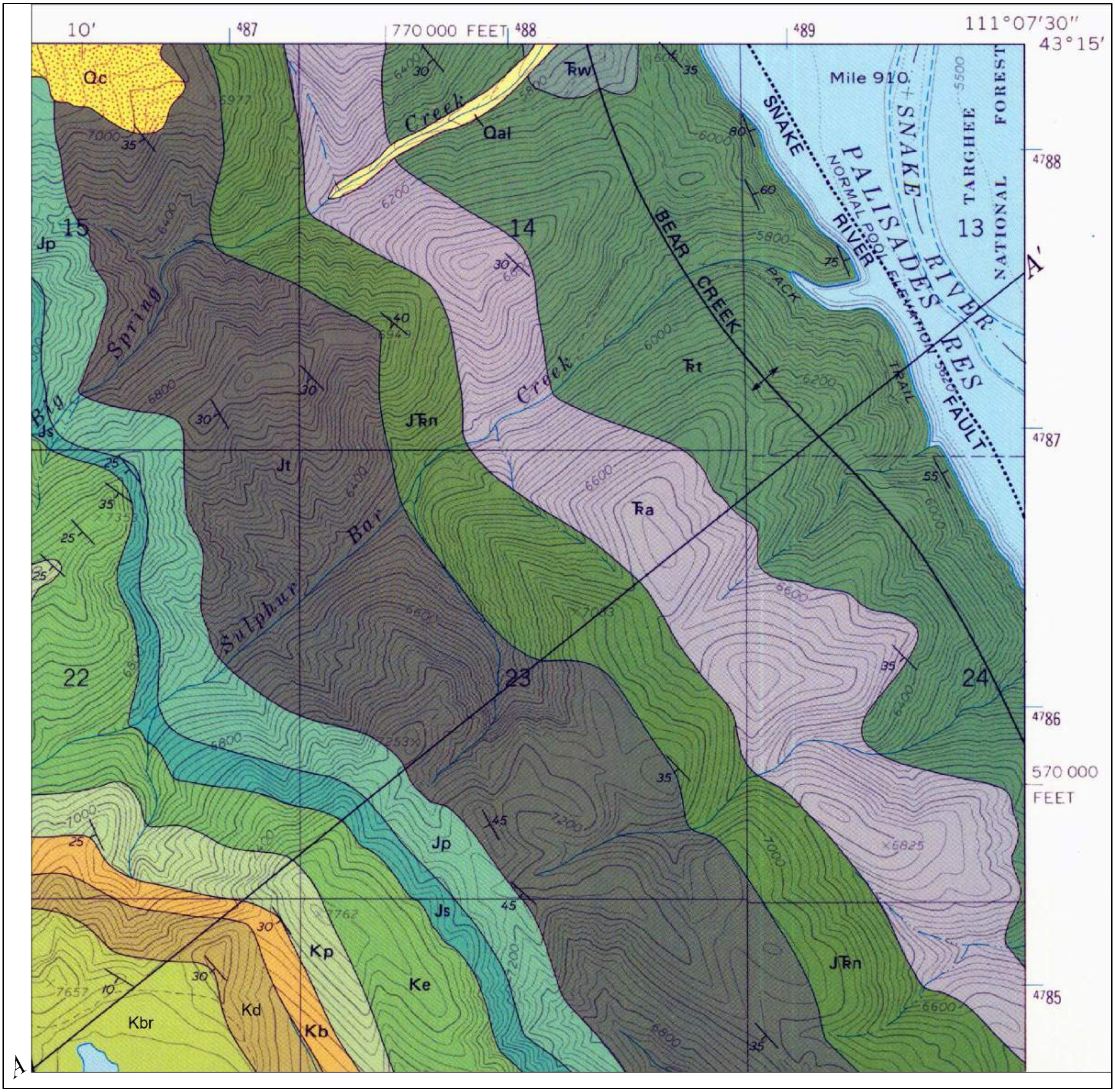
FIGURE 2 : questions 38) to 40) refer to (5pt total)

38) What measurements are the geologists in panels A-G taking? **(3.5pt, T2)**

39) What does the arrow in panel B represent?

40) a) What operation is illustrated in panel H? (0.5 pt)
b) Describe two applications for this type of operation in the field. **(2pt, T10)**
c) Look at the Aquifers of Texas Map and the Industrial mineral of Texas Map. Name the two aquifers that would be the most suitable and the two that would be least suitable for this operation.

MAP 1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489
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Qal
Creek
Trw
Mile 910
SNAKE
PALISADES
SNAKE
RIVER
RES
TARGHEE
NATIONAL
FOREST
NORMAL POOL ELEVATION 5620
RIVER
FAULT
BEAR
CREEK
PACK
TRAIL
15
14
13
Jp
Spring
Big
Js
Jt
JTrn
Trt
Tra
Creek
Sulphur
Bar
22
23
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Jp
Js
Kp
Ke
Kbr
Kd
Kb
JTrn
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4787
4786
4785
570 000
FEET
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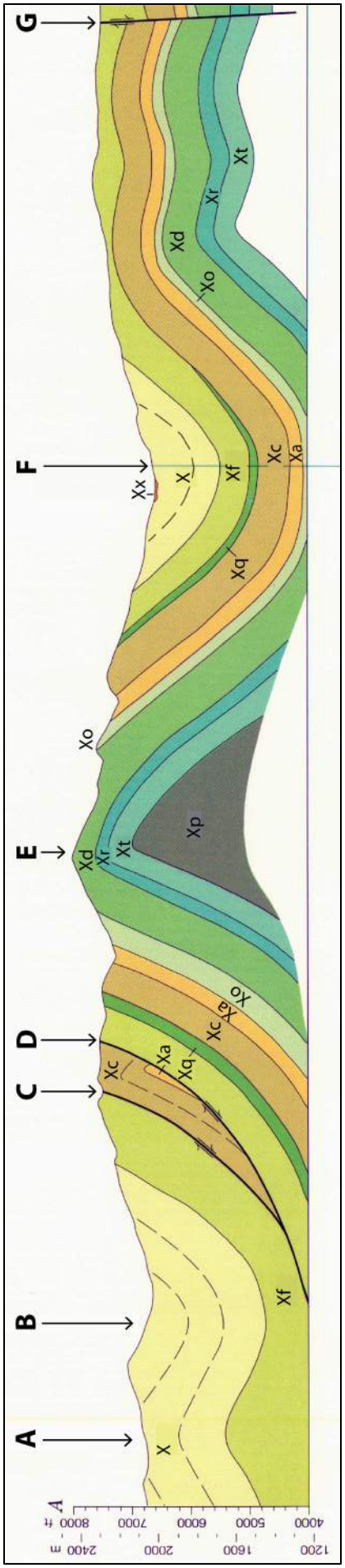
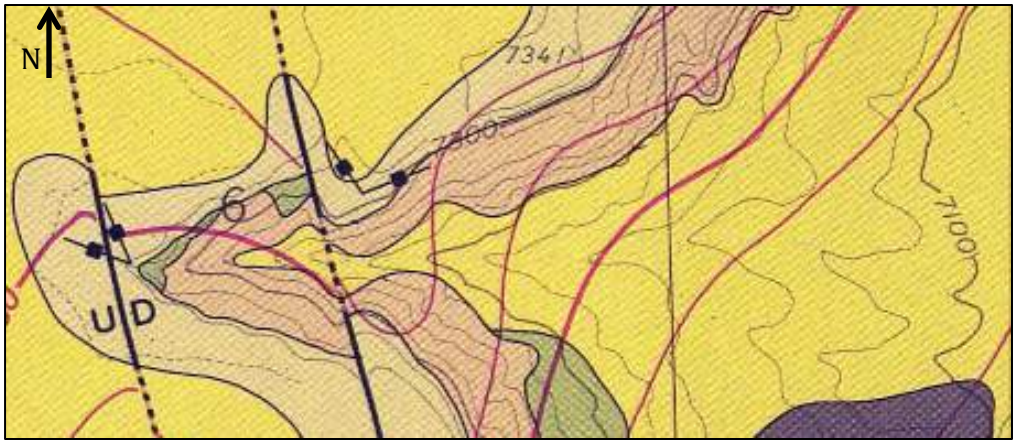
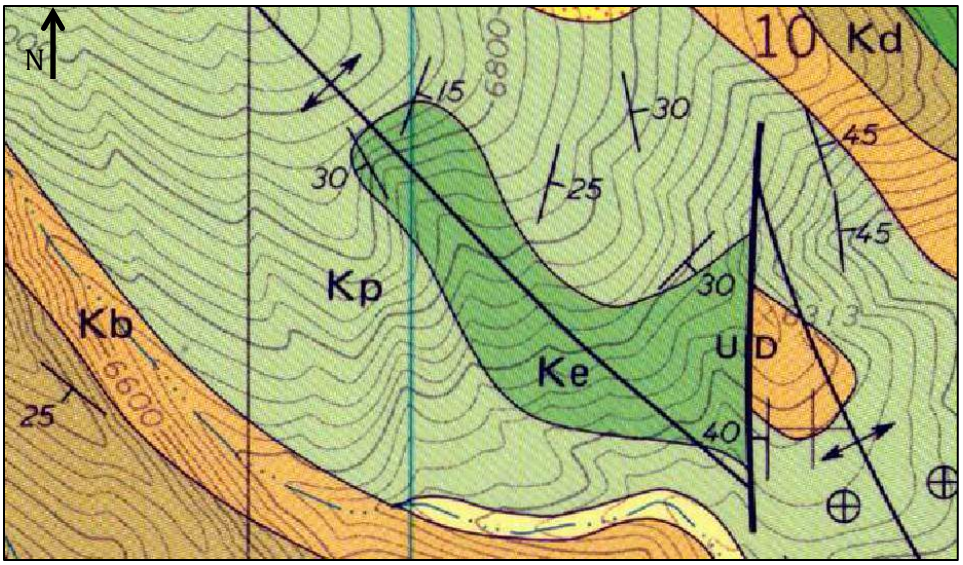
MAP 2



MAP 3



MAP 4



MAP 5

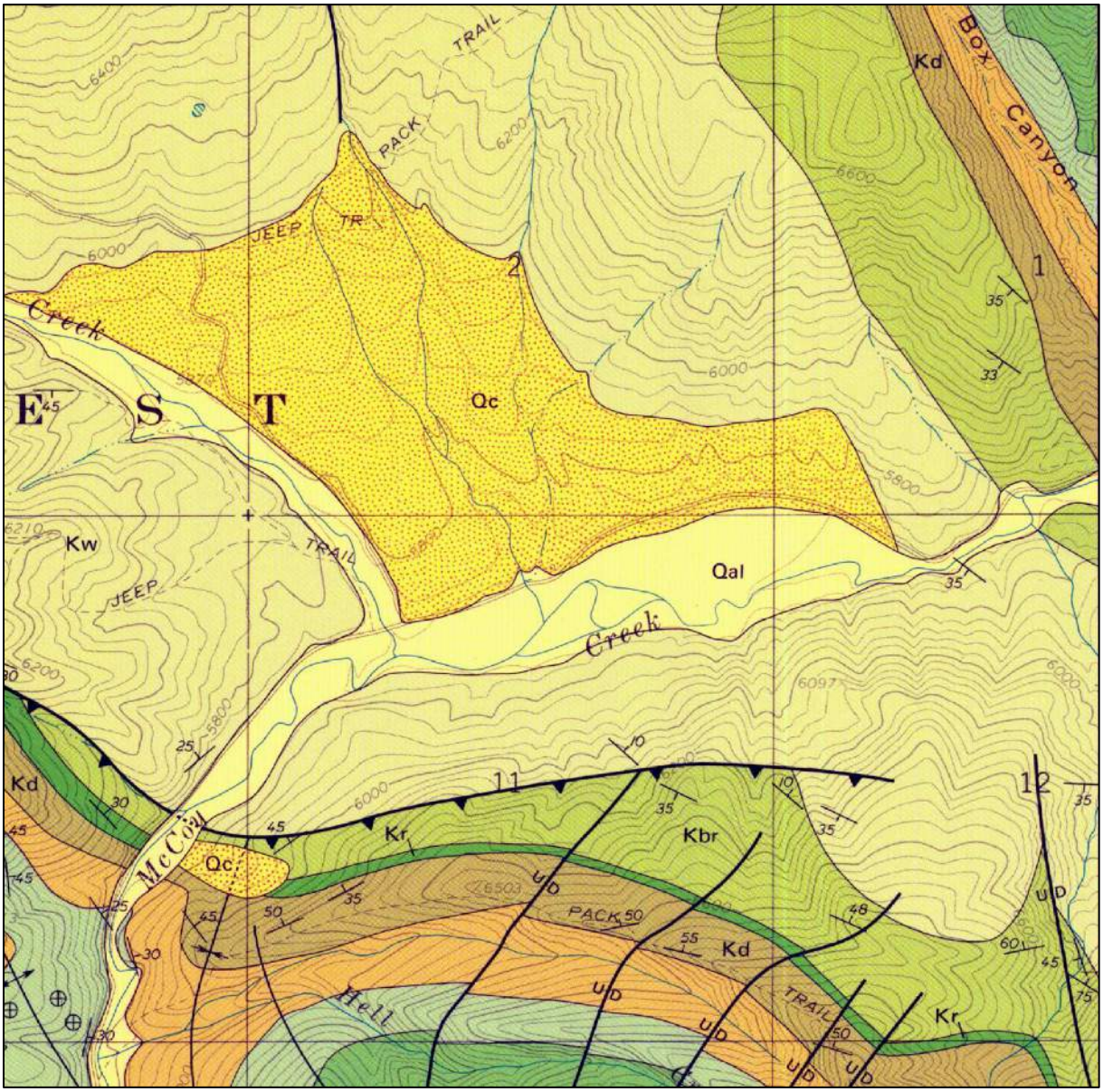


FIGURE 1

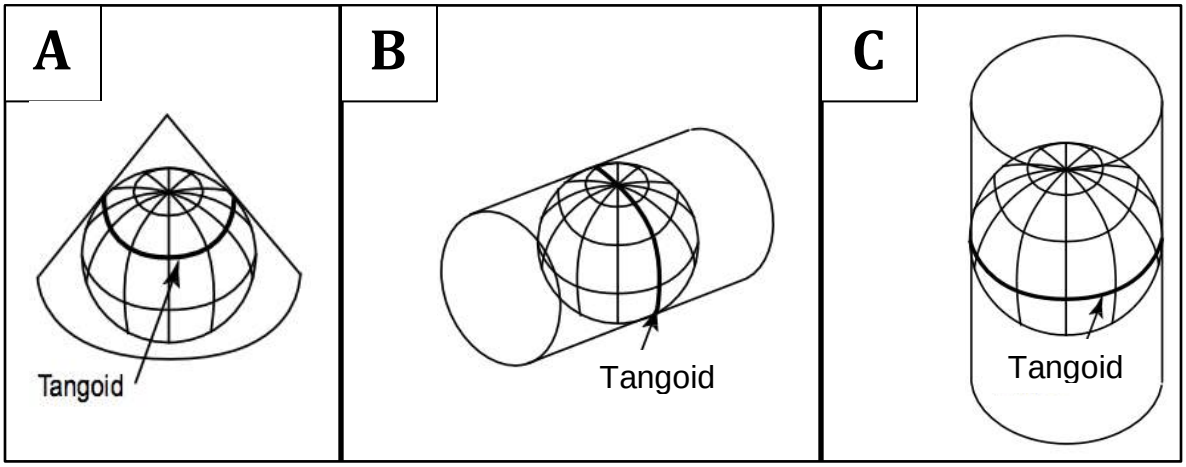


FIGURE 2


A
roberk.eduweb20.com
B
geologyin.com
C
gemoc.mc.edu
D
geologyin.com
E
eesc.columbia.edu
F
turkanabasin.org
G
asunews.asu.edu
H
mtech.edu